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IN TWO PARTS

PART ONE
ARCHITECTURAL DESIGN

APRIL
1928

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Published Monthly by

ROGERS & MANSON COMPANY

383 Madison Avenue, New York

Howard Myers, Pres.; James A. Rice, Vice-Pres.; Paul W. Hayes, Vice-Pres.; Robert Sweet, Sec. and Treas.

Yearly Subscription, Payable in Advance, U.S.A., Insular Possessions and Cuba, $7.00. Canada, $8.00. Foreign Countries in the Postal Union, $9.00

Single Copies: Quarterly Reference Numbers, $3.00; Regular Issues, $1.00. All Copies Mailed Flat

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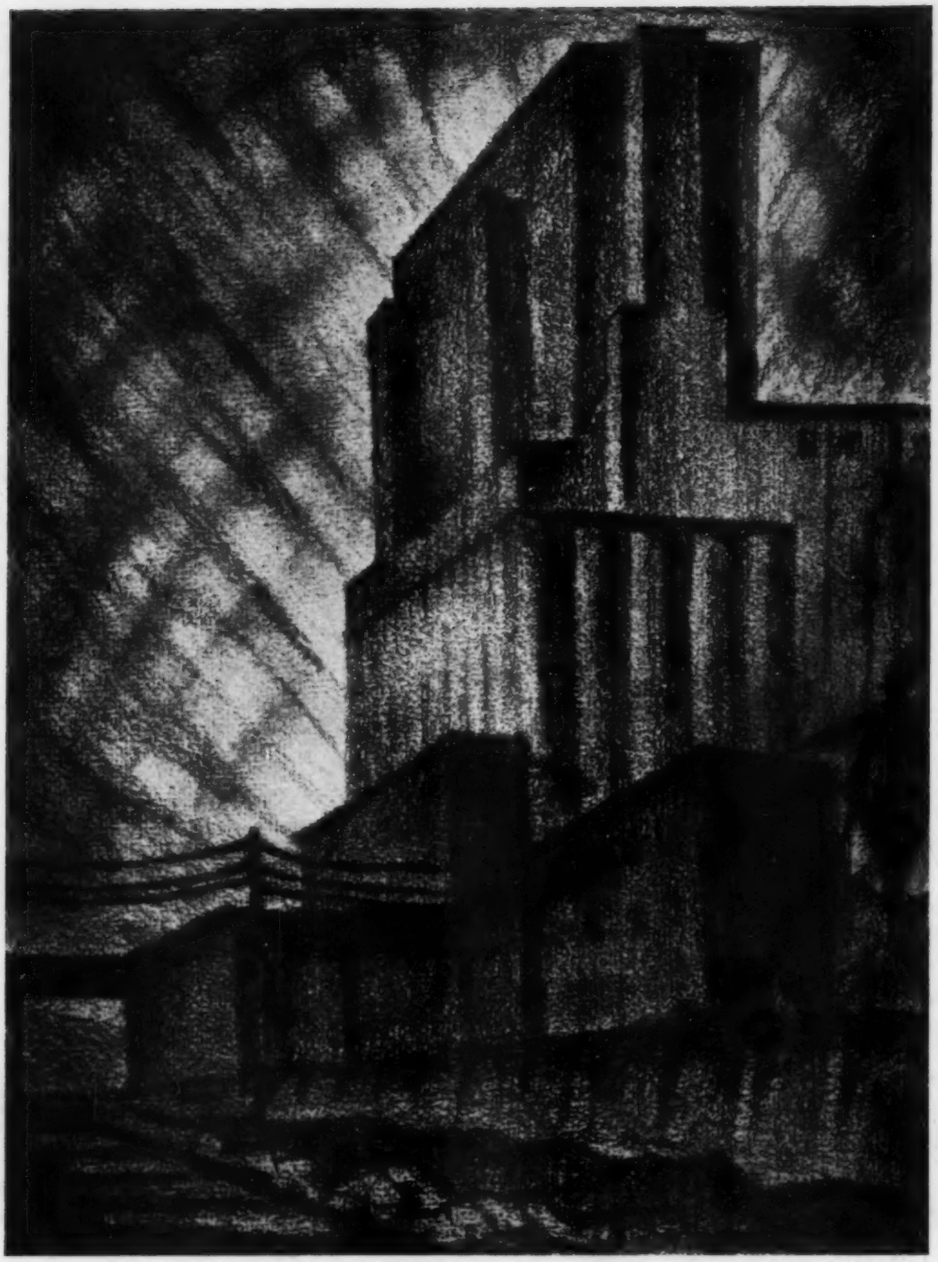


GRAIN ELEVATORS, SIDNEY, AUSTRALIA

From a Charcoal Sketch by Alan Devereux, A.R.I.B.A.

UNIV. OF MICH.

THE
ARCHITECTURAL
FORUM

VOLUME XLVIII NUMBER FOUR

APRIL 1928

ON THE PHILOSOPHY OF MODERN ART

BY
ALAN DEVEREUX, A. R. I. B. A.

WHAT is art? That is a question which many have asked and many have answered,—in as many different ways. It seems to me, however, that there can be only one definition of art in its broadest sense,—"creation through inspiration." From this one postulates that a true work of art contains beauty,—though not necessarily the accepted standard of beauty. Perception and subsequent appreciation of beauty are esentially relative and consequently dependent on the varying human viewpoint. As an instance of this, we can now perceive beauty in the subtle moods of Japanese and Chinese art, primitive peasant art, and negro sculpture, where our forefathers could perceive none, or at best only a sort of meretricious "quaintness"; a further instance of this is the recent growth of appreciation of the art of the European primitives of the middle ages, and of the paintings of El Greco and William Blake. As a development of the definition already given, one may add that inspiration is the quality that creates from the inner appreciation of the beauty of things perceived, and, being thus conceived, gives birth to art. For beauty may be perceived everywhere and in many ways, proportionate to one's powers of perception. A trained mind can perceive beauty obviously, where a clod will remain unmoved.

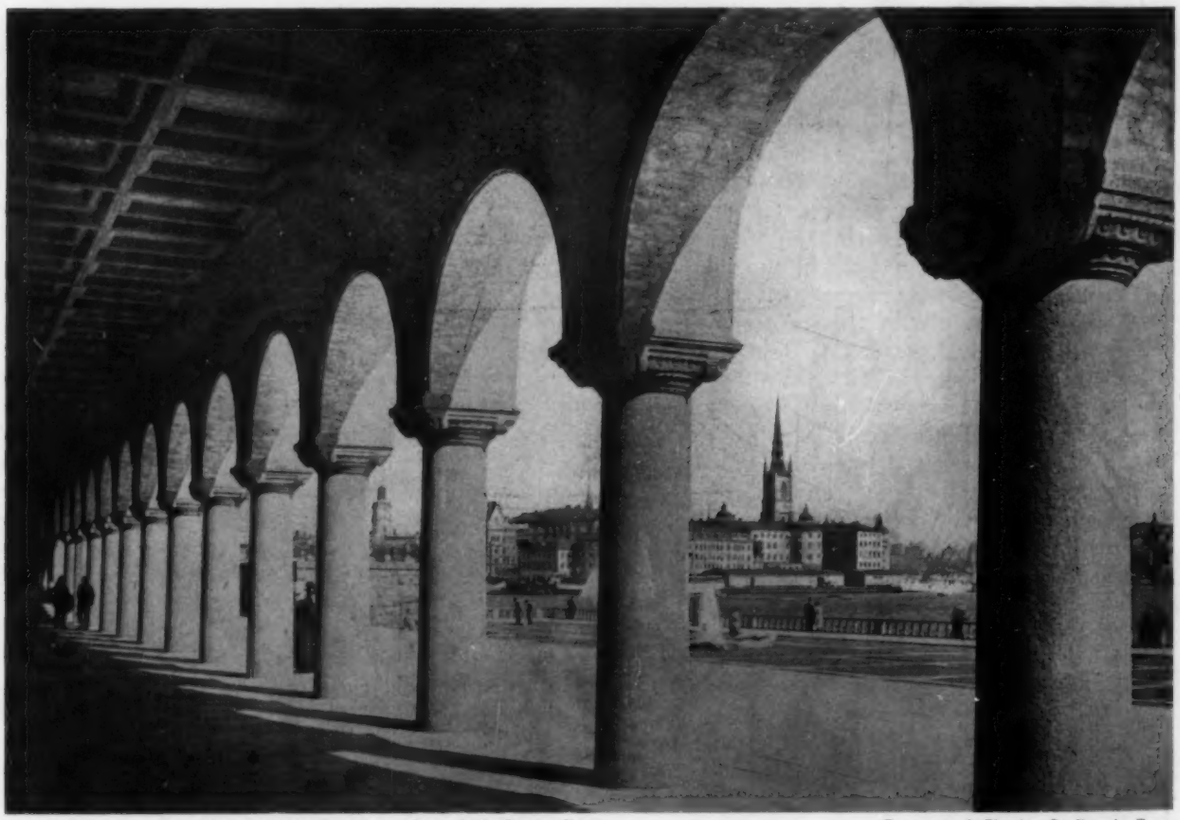
There has never been and there never will be any true significant beauty in the merely picturesque, which appeals only by means of the falsely sentimental values attributed to it by the untutored mind. True beauty is the sympathetic aid, essentially relative, æsthetic quality acknowledged by the intellect to be inherent in certain things of which we are conscious, so that it reacts on the imagination of the individual, suggesting in varying degrees the spiritual perfection of the unattainable. When some natural object or mental concept of anything at all is filtered through the artist's power of inspiration, and is translated into stone or paint or sounds or words, it should acquire a subjective or spiritual quality,—or soul, if you like,—that causes the result to live as a true work of art. Stripped of its clothing this elusive, subjective quality is what modern artists of recent years have been looking for, and their researches have had some surprising and interesting results. This modern art does not seem to care at all for appearances. The reason is, of course, that art has turned its boudoir into a laboratory, to many people's deep disgust, and is now in its working clothes, testing, experimenting, exploring, seeking to regain that creative spirit that it has lost. It has discovered that it has something to say, and says it with no uncertain voice,—"creation, not imitation." It has found out that a purely faithful imitation of anything in nature can never be art, however skillful that imitation may be; it can be only something second-hand, like a photograph or a player piano record. In speaking thus of the experimental tendencies of modern art, I am of course not referring to art in Australia, where I have been practicing architecture for the past five years. There is, practically speaking, no artistic research work of this nature going on there, excepting possibly in the work of John Moore, Norman Lindsay, Kenneth McQueen and one or two other lone explorers. The country is as yet too young, and too preoccupied with its material struggles to bother with metaphysical experiments in art, and Australian artists, brilliant as many undoubtedly are, are too cut off from the rest of the world, and too busy seeking a pathetically insecure livelihood to go much further than to cover the existing ground, and consequently cannot afford to ignore the inhibitions of popular taste.

But it is not of art in Australia that I write, but rather of this new modern art that has sprung up in Europe and America of recent years, which seems so puzzling to many people, and possibly I may help to straighten out a few misconceptions that may exist on the subject. In social contacts I find that it is the rule rather than the exception, even in the most cultured circles, when the subject of modern art is brought up, to dismiss it as being queer, distorted stuff, crazy cubism, or futuristic foolishness, apparently perpetrated by absinthe-soaked madmen during attacks of delirium tremens. It is, of course, just as easy to thus airily dismiss in a summary manner any other subject about which one happens to be in ignorance, such as higher mathematics as a lot of dry figures, or Einstein's theory of relativity as a proof that straight lines are really crooked; but if

they really cared to look, they would find modernism all about them; they forget that the world still goes forward, ever seeking, ever finding new things and enlarging the scope of human consciousness, entirely irrespective of those who will not keep up with it, and who consequently are left behind.

Art, with a few exceptions, had fallen steadily back during the last three hundred years, until in the final part of the nineteenth century it had reached such a low ebb that it had practically ceased to be true art at all; but it is now again moving forward on the path of evolution, as all things must. The timely invention of photography eventually barred the way to any further depths of imitative naturalism in painting and sculpture. The setback to the progress of artistic evolution, due, perhaps chiefly to economic reasons and to the industrialization of the world which was rapidly changing human society, was, fortunately, only temporary. The world is by degrees getting used to the effects of the industrial system, and everywhere one notices a revival of interest in creative rather than imitative art. It is generally understood that there is far more spiritual freedom nowadays, compared with the cramping conservatism of the last century, and that this generation is far more concerned with the things of the spirit than were former generations. There is abundant evidence of this in the fact that art is once again moving forward, and in order to keep up with it one must understand what it is all about,—one must learn the language. If art were to continue to appeal only to the simplest and least sophisticated minds of the community, it would never go forward, and the fact that it is going forward is sufficient evidence to show that already there is a large section of the public in other countries which has taken the trouble to carry artistic education a little further than the "twice times" table and words of one syllable.

Of course we all understand that there are certain individuals among the forward-moving group, as there are in every field of endeavor, whose work moves in a circle, and consequently never succeed in getting anywhere. If they do succeed in fooling the public, it is largely because their misplaced enthusiasm has caused them to fool themselves. But they seldom succeed in deceiving their fellow artists. Their efforts are similar to those of the Italian futurists some 14 years ago under the leadership of Marinetti, which although of significance in discovering a rather mathematical method for the portrayal of abstract qualities, such as motion and sound, did not succeed in achieving any relative success. Thus after giving birth to a few fresh and original ideas not altogether without a certain amount of influence on modern art, the movement was diverted into other channels and died a natural death. But to return to the close of the nineteenth century and the "twilight of the arts" which culminated in the invention of photography. By this discovery art was naturally diverted into the further



Illustrations from "Swedish Architecture of the Twentieth Century" *Courtesy of Charles Scribner's Sons*

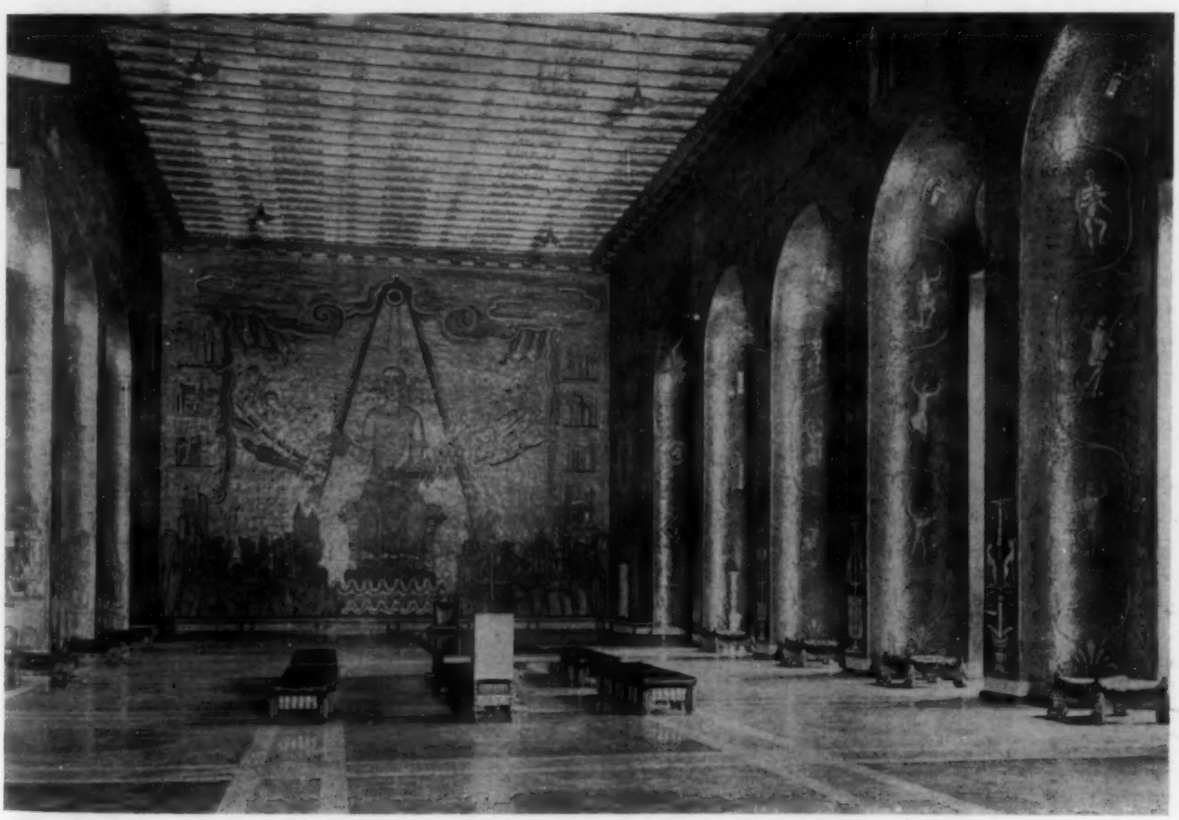
Loggia Overlooking Malar Lake, Town Hall, Stockholm

Ragnar Ostberg, Architect

cul-de-sac of impressionism, which may be defined as the recording of instantaneous impressions of color from the point of view of the human eye as a camera, involving what amounted to the scientific analysis of light, so that presently artists were ceasing to paint objects themselves, but their color impressions instead.

There were three great painters who appeared on the scene about this time. Cezanne, Gauguin and Van Gogh,—old masters now, who like most "old masters" were bitterly reviled in their time. These men saw their way out of this *cul-de-sac,* or at any rate saw clearly enough to be dissatisfied with it. Their dissatisfaction, however, as Sheldon Cheney puts it, was only part of the general dissatisfaction which the Victorian age was beginning to feel with itself. This feeling of unrest and dissatisfaction, which was so noticeable in the paintings of Cezanne and his post-impressionist followers, and which is so noticeable in the work of many of the younger artists of Europe and America today, was but a reflection in art of a change that was, and still is, coming over the world in its attitude toward life and the universe. Apart from its relation to art, materialism as a philosophy had begun to lose credit among thinking people, one of the reasons for this being, perhaps, the discovery that materialism would not completely explain the mystery of existence. Every period hitherto has found it necessary to hold certain postulations as being absolute and axiomatic. The last century accepted as absolute the facts of "laws" of nature,—that is to say, if one had facts, one therefore had the ultimate reality. Recent scientific research, however, into the constitution of the universe and of the human mind, has revealed that what we call facts, are, after all, only convenient explanations for dealing with the unexplainable in its relation to ourselves,—convenient pegs, in fact, on which to hang our philosophies. But although the pegs may seem real enough, we are beginning to realize that there is no solid wall to stick them into. Einstein has shown us that. Without any fixed datum point in the whole universe upon which to base our assumptions, we find that all our conceptions become purely relative rather than absolute. This Einstein theory of relativity may be considered as the culminating factor in the disillusion of nineteenth century materialism, and would seem, as far as a layman may judge, scientific thought to reduce all our axioms to the First Principle, or, as the Eastern mystics have it, "All is Brahma."

Art, therefore, has had to seek new forms and new outlets, and to do this it was necessary to discard many false ideas and misconceptions. It had to go back to fundamental principles, such as are found in the art of primitive times, when art was inspired entirely by the creative spirit, before it had been cramped and stifled by materialism, and when it still had the childlike naïvete of the savage,—such principles as are found in the abstract purity of the



Interior of Guild Hall, Town Hall, Stockholm
Ragnar Ostberg, Architect

Greeks, the form and humanity of the European primitives, and the mystic quality of Gothic art. Upon these foundations it was necessary to build with an entirely different end in view,—the creation of subjective truth rather than of objective truth. It was the realization of this that led Cezanne and the post-impressionists who followed after him to restore the third dimension as a quality of their design, while avoiding it as a means of portraying realistic illusion, and to make as their aim the solidity of form, not to the eye, but to the mind. This re-discovery of the third dimension in art resulted in the frequently misunderstood but extremely interesting and significant form of artistic research known as cubism, first conceived by a Franco-Spanish painter, Pablo Picasso. The fundamental idea of this cubism, I think, was that of disassociating the planes and also the perspective of an object seen, and of rearranging them in a picture in such a way that they will give a truer emotional or structural sense than appeared in reality. After all, as one sees an object from one side only, it is therefore an incomplete viewpoint. A complete vision would show it not only from all sides and aspects, but also from within. Possibly some day there may be discovered a scientific equivalent for such a viewpoint. In painting, anyway, the idea seems to be to so reorganize the planes of an object as to express the painter's æsthetic emotion of it, rather than his visual impression of it. It is an interesting fact, in parenthesis, that Picasso and his followers are extremely sensitive and capable draftsmen and colorists from the more classic point of view. Some, indeed, were already famous, which goes to show that they have at least earned the right to experiment, and that there is method in their madness.

Cezanne, before he died, said: "I am the primitive of the way I have discovered." In turning to that aspect of modern thought known as "expressionism," we come to the full current of Cezanne's influence. This does not necessarily mean that expressionism was the "way" that Cezanne discovered, but it is certain that no other movement has since had so much influence on the art world as expressionism. This movement seems to rise above the limitations of other more doctrinaire movements, such as cubism, futurism, vorticism, etc., while embracing all of them. It approaches art from an entirely different standpoint, and is only opposed to art that is merely imitational. It has invaded the field of literature and the drama. Expressionistic playwrights are already widely known in Europe and America. Expressionistic architecture is now commonplace on the continent of Europe and in the larger cities of America. Expressionism is found even here in America in the graceful lines of a racing motor car or of an aeroplane or sailing yacht, in the hum of a dynamo, or the majesty of a locomotive, and in many other ways as yet unrecognized as such by the general public. Expressionism is, in fact, really a summary of all that is characteristic of the twentieth century, and is not merely a passing phase. The quality about it that is perhaps most indisputably modern is its intensity. Human consciousness has broadened, the rhythm of life has quickened, fast transport has reduced space and given us new sensations, lights are brighter, and noises are louder than ever before. Art cannot remain as quiet as it has been in the past. It must not slip into being a mere refuge from life. Its value must be intensified. It must live up to the age.

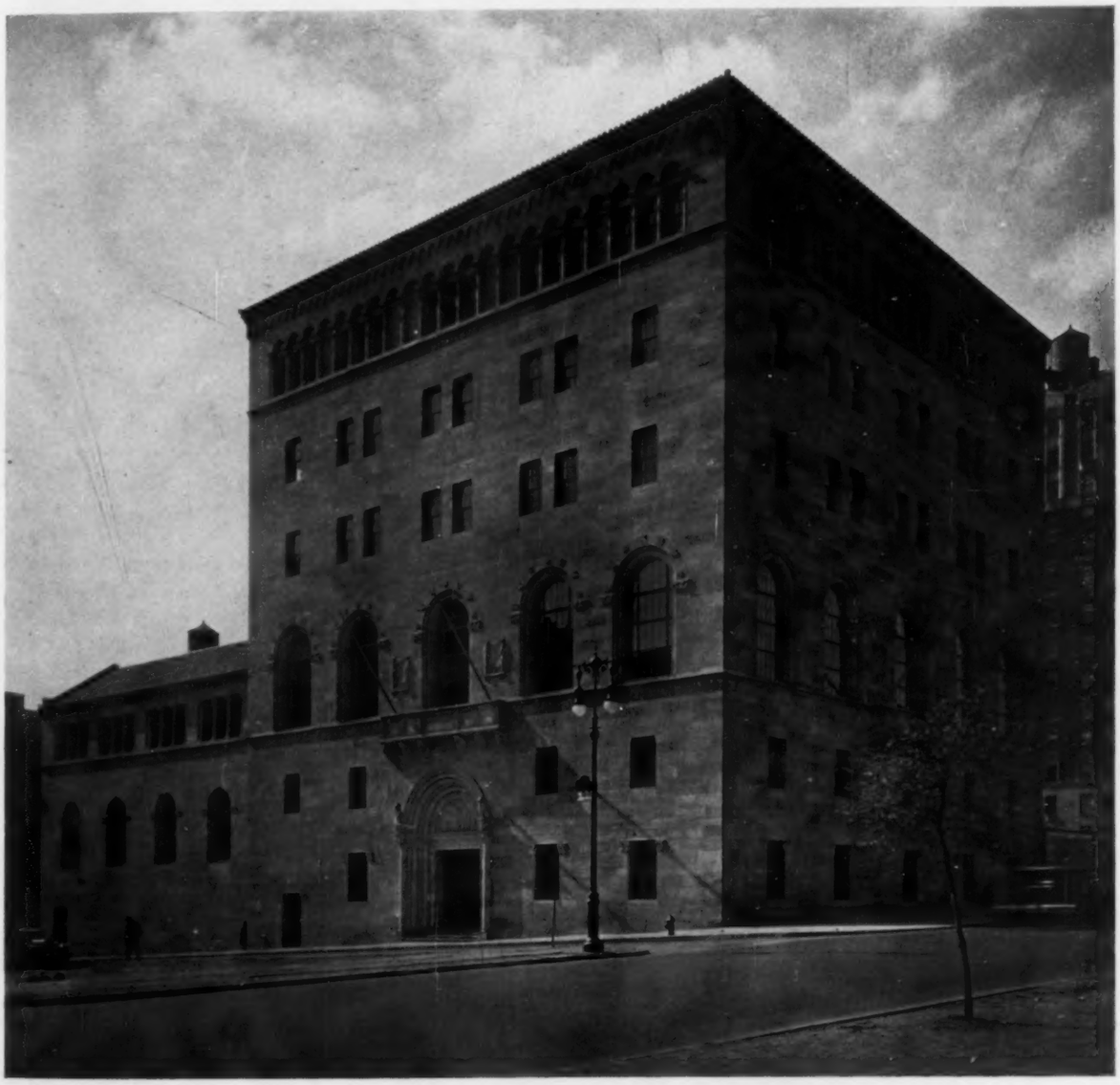
Tower and Lake Front, Town Hall, Stockholm
Ragnar Ostberg, Architect

And the new age is giving expression to the new art. Buildings are now being built higher than ever before, glorying in their height, reflecting power and intensity. Painting finds new values in purer color and purer form upon more subjective and abstract lines. Sculpture is being composed again in simple and more plastic form arrangements. Dramatists are beginning to forsake the old hokum and the old formulæ, and to pile up emotional climaxes, with little regard for naturalistic atmosphere, as in the works of O'Neill and Pirandello, who succeed in portraying life more directly almost than life itself can do. Directness and intensification have now become the order of the day, and it seems to me that only by use of some such process can art keep up with life. It can never be satisfied with an anæmic sentimentalism or mere prettiness,—and the proof is all around us, whether we like to recognize it or not.

THE NEW YORK ACADEMY OF MEDICINE

BY
MATLACK PRICE
YORK & SAWYER, ARCHITECTS

IT is not at all in the realm of over-statement to say that in the new building for the New York Academy of Medicine these architects have not only added another distinguished piece of work to their already long list of achievements, but have also shown us that amid the exciting æsthetic experiments of the 1890's we too quickly skimmed over a particularly rich chapter in the picture book of architecture,—the chapter of Byzantine and Romanesque. There may even be some younger architects to whom Richardson's great Romanesque revival does not mean anything very real or definite, and who suppose that if it had really amounted to much it would not have been so soon abandoned in the pursuit of more exciting architectural adventures. Montgomery Schuyler hailed Richardson's Romanesque revival as the logical solution of all the problems involved in modern building, and gave thoroughly sound reasons for his conclusion. And Richardson, who was not without followers or without admirable convictions of his own, backed by the best critical acceptance of his time, might indeed have more permanently influenced architectural style in this country if it had not been for the purely fortui-



New York Academy of Medicine
York & Sawyer, Architects

Doors in Main Entrance Hall

tous advent of the World's Columbian Exposition at Chicago and McKim, Mead & White's introduction there of an adapted Italian Renaissance. Certainly, after all that has happened in the half-century since Richardson's great adventure in Romanesque, it is intensely interesting to see the firm of York & Sawyer, themselves among the most able and brilliant offshoots of the old firm of McKim, Mead & White, turn back to that chapter of Byzantine and Romanesque and bring forth from it a version of these styles so new, so fresh, so vital as to seem almost the same stuff as the modernistic trend of today, the difference being that this new revival of Byzantine and Romanesque is far better than most of the modernistic work is, or is likely to be. This structure is among the most interesting of recent buildings.

The New York Academy of Medicine has shown, among other things, that the Bowery Savings Bank on 42d Street, by the same architects, was not at all an accidental or isolated success. The Academy of Medicine is of the same sort, and it is only reasonable to hope that these architects will go on with the development of this manner until its widespread influence is felt. The simple fact is, that it is good architecture. And it is good architecture because it satisfies not only the larger conditions of a building, but effects a nice relationship between wall surface and detail, and with detail which, in itself, is adaptable to a curiously modern manner of handling. The exterior of the New York Academy of Medicine affords a good demonstration, as practical as it is æsthetic. There is plenty of latitude in the treatment of cornices (and the fashion nowadays is to minimize them); here also is used the infinitely adaptable *motif* of rows of small round arches, which may be scaled to frame windows or to serve as an enriched frieze; here too is used an adaptable method of window and door treatment, which may be as simple or as elaborate as the nature of the building requires. If a feature is needed, there is the balcony, which, as in the Fifth Avenue elevation of the Academy, may be supported on grotesque brackets, which like the corbels and capitals that abound in Byzantine and Romanesque may be as playfully grotesque as one likes and as may be appropriate.

As an important exterior detail, the design and execution of the incised lettering, both in the large inscription and in the window heads, must take its place among examples of the finest architectural lettering that has been done so far in this country. The various functions and purposes of the New York Academy of Medicine are succinctly outlined here by the director, Linsly R. Williams, M. D., so I shall comment only on the architectural aspect of certain of the interiors. These all have a quiet dignity befitting the building, and a manner thoroughly consistent with its whole character. The hall is broad and gracious, without being at all severe; there is

Stage and Proscenium Arch in the Auditorium

subdued color in the painted wooden ceiling, color in a fine large tapestry and incident in the door-heads.

To the right of the hall is the large "collation room," where meals may be served, and a smaller room in quiet green, also used at times for dinners. Between these two rooms (characteristically of York & Sawyer's always able planning) there is a very complete and very modern kitchen. To the left of the hall is the great auditorium, designed with exactly enough detail to be interesting and to escape bleakness, and with exactly enough plainness and simplicity to avoid distraction from the serious matters that are here discussed. The detail, of course, is again in this emancipated Byzantine-Romanesque manner, applied with the restraint of true art; the lighting fixtures are admirable, and the rostrum and other stage furnishings are of great dignity. There is interesting design,—and excellent restraint,—in the walnut seats across the back of the stage, suggesting and yet not at all simulating choir stalls.

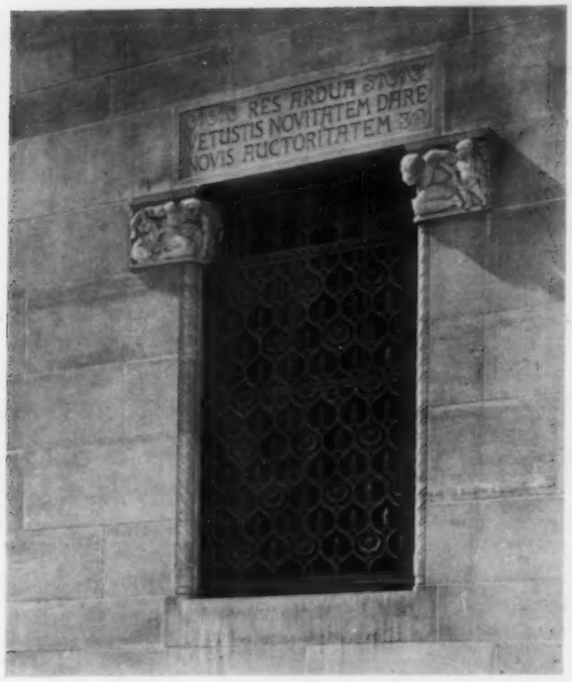
Architecture, and in this case the firm which designed this thoroughly modern building in such a blythe revival of a style that evolved in the sixth century, have served architecture's purpose extremely well in the planning and designing of a building which is not only practical and efficient, but of a dignified and gracious manner consistently expressed by the essential good taste of its skilled designers.

HISTORY AND PURPOSE OF NEW YORK ACADEMY OF MEDICINE

BY

LINSLY R. WILLIAMS, M.D.

HUNDREDS of years ago physicians understood that they learned by experience, just as did the members of other professions, and appreciated that, as their services were for the relief of suffering and the prevention of disease, if their experiences were exchanged, the advancement of knowledge would take place more rapidly and thoroughly. This attitude of mind was expressed in New York over a hundred years ago by the organization of a number of societies. As time went on a group of prominent physicians felt that at least one society should be permanent, and that this society should have as an accessory a library where all physicians could have access to the most recent contributions of medical science. Thus in 1847 a medical association was organized and four years later incorporated under the name of "The New York Academy of Medicine." The new Academy passed many years in search of a permanent home and finally purchased an old house at 12 West 31st



Window on Fifth Avenue Facade

Side Door on East 103rd Street

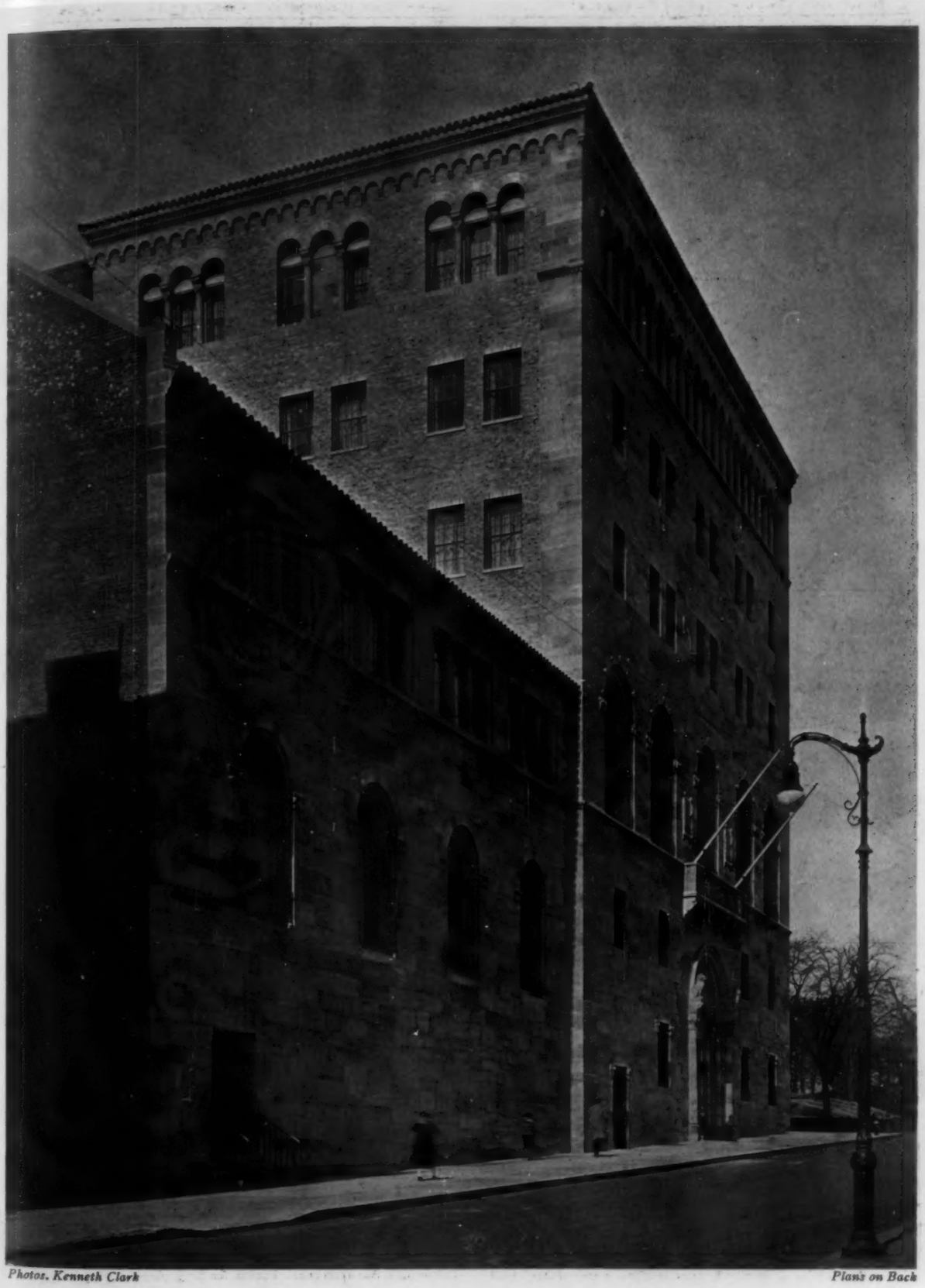
Street, and in 1889 moved into a new building at 17 West 43rd Street. Shortly after its opening there was an interesting note in one of the annual reports: "The opening of our new home and the development of its facilities, which are unsurpassed, have been attended, not alone with pleasure to its fellows and friends, but with that which this department has been compelled to recognize,—increase in expense."

Just as its facilities at 31st Street were outgrown, within 20 years its facilities at 43rd Street became inadequate on account of the rapid growth of the library and the limitations of stack space, to provide which was one of the primary purposes for which the Academy was founded. Who could have foreseen in the 80's that within 30 years the Academy would be adding 5,000 volumes a year to its library as well as many thousands of pamphlets? Appreciating the importance of books and the library, open to all medical men and to the public, the new building at Fifth Avenue and 103rd Street was conceived with the idea that stack space should be provided for an almost indefinite number of years. As the library is perhaps the most important part of the Academy, the plans provided for the new building a very large, beautiful and comfortable reading room; an additional reading room for journals; a quiet, comfortable and charming small library, reserved for the fellows or members of the Academy; and a book stack which would house 150,000 volumes and over 100,000 pamphlets,—enough space for at least the next 20 years. For future enlargement of the stack and building, the stack is so planned that it can be extended upward and laterally, so that space will finally be available to house nearly 1,000,000 books.

The Academy has functions other than that of maintaining a library, and supplies a most important meeting place for physicians from all parts of the city. The fellows of the Academy, who number nearly 2,000, are divided into 12 different sections of specialists on diseases of children, diseases of women, nose and throat, ear, etc., and these different sections hold monthly meetings at the Academy building. On the various floors of the six-story building are smaller rooms of differing sizes for committee meetings and offices of the different medical societies, as well as the offices of the Academy itself.

The Academy maintains a bureau of information on facilities for medical education for physicians not only in the city but for physicians who come from the rest of the United States and abroad. About 500 physicians from out of town visit this bureau annually, seeking advice in regard to post-graduate work and the various hospital clinics which are being held in this city. Further information is available for physicians who desire post-graduate courses in Europe or in the United States outside of New York.

The New York Academy of Medicine is a limited-membership association and is governed by a council which consists of the ten elected trustees, the six officers, and the chairmen of four standing committees. The ten elected trustees are required by law to hold and supervise the property and investments of the Academy. The present building of the Academy was donated by the Carnegie Foundation of New York. The endowment of the Academy amounts to a little over two and one-half million dollars, nearly one and one-quarter million of which has been donated by the Rockefeller Foundation of New York.



Photos. Kenneth Clark *Plans on Back*

NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS

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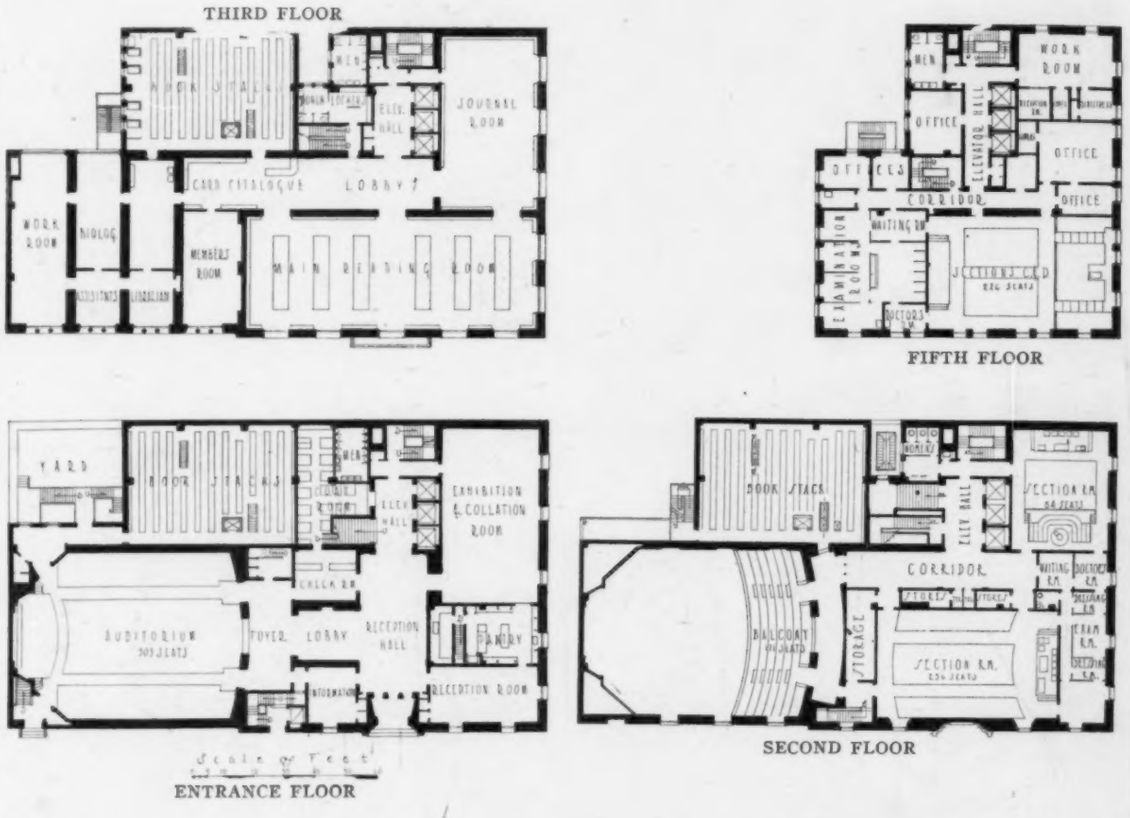
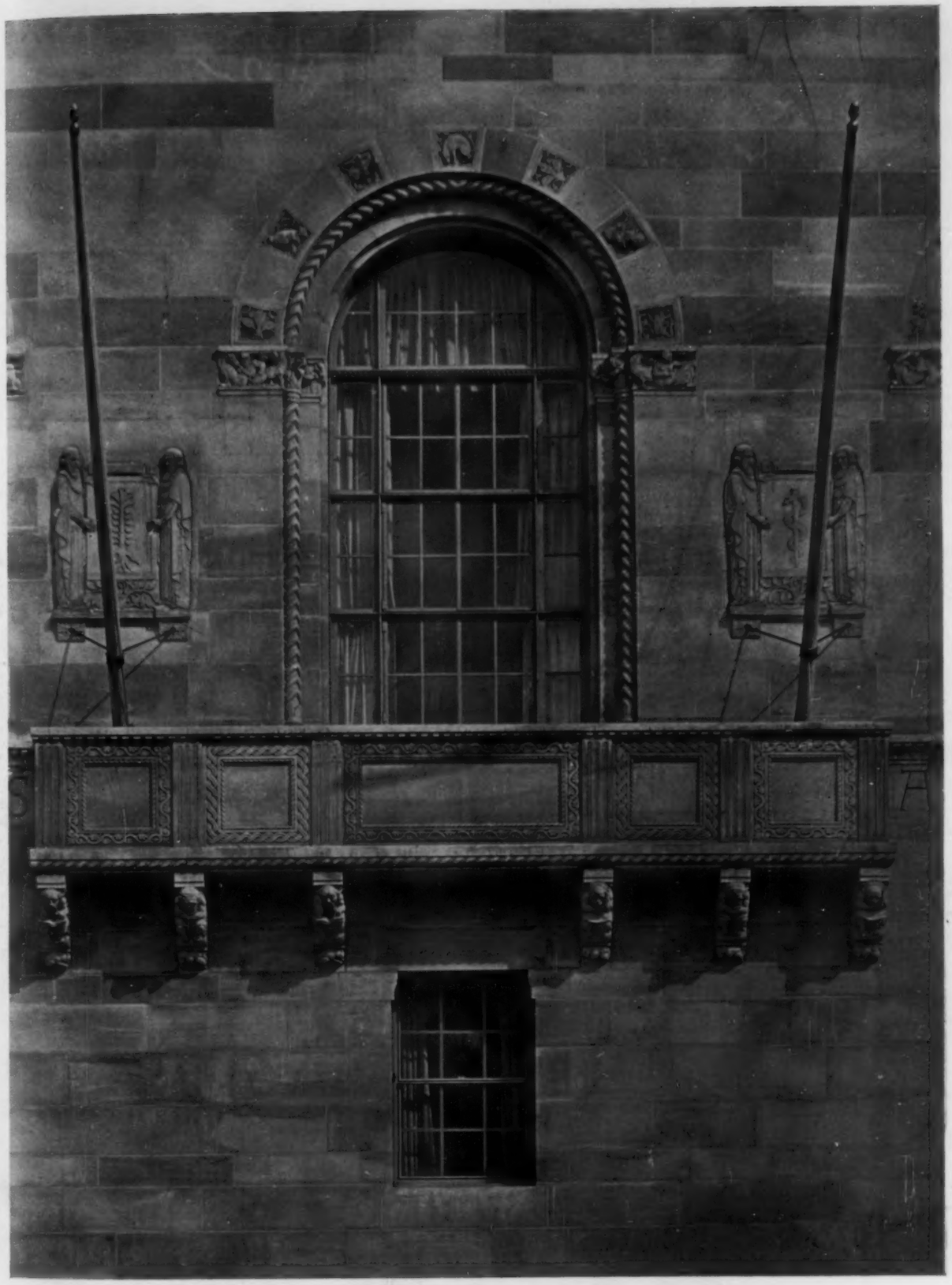


PLANS, NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS

Editor's Note. Measured Details Will Be Published in THE ARCHITECTURAL FORUM for May



WINDOW ON FIFTH AVENUE FACADE
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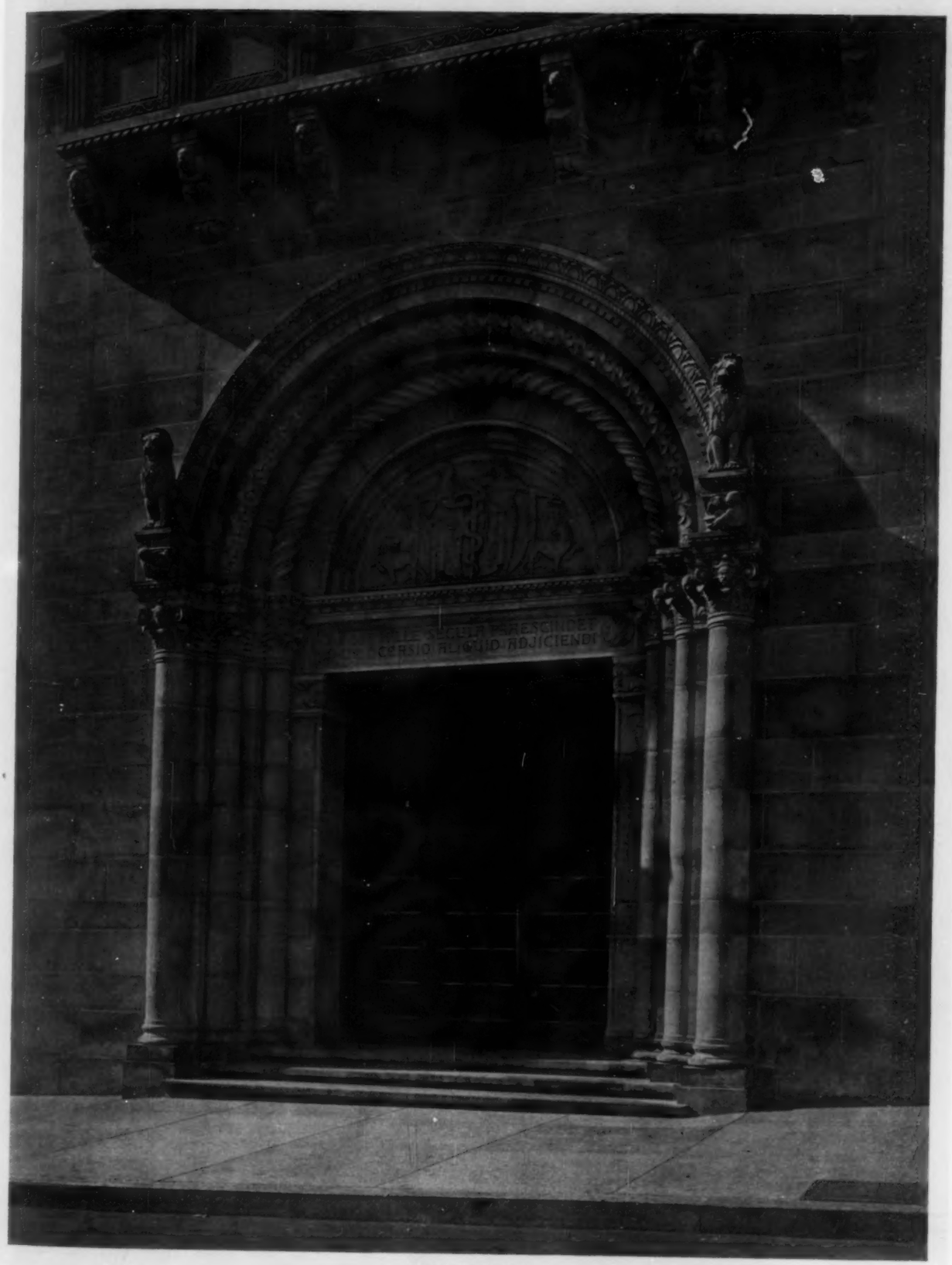
YORK & SAWYER, ARCHITECTS



MAIN ENTRANCE
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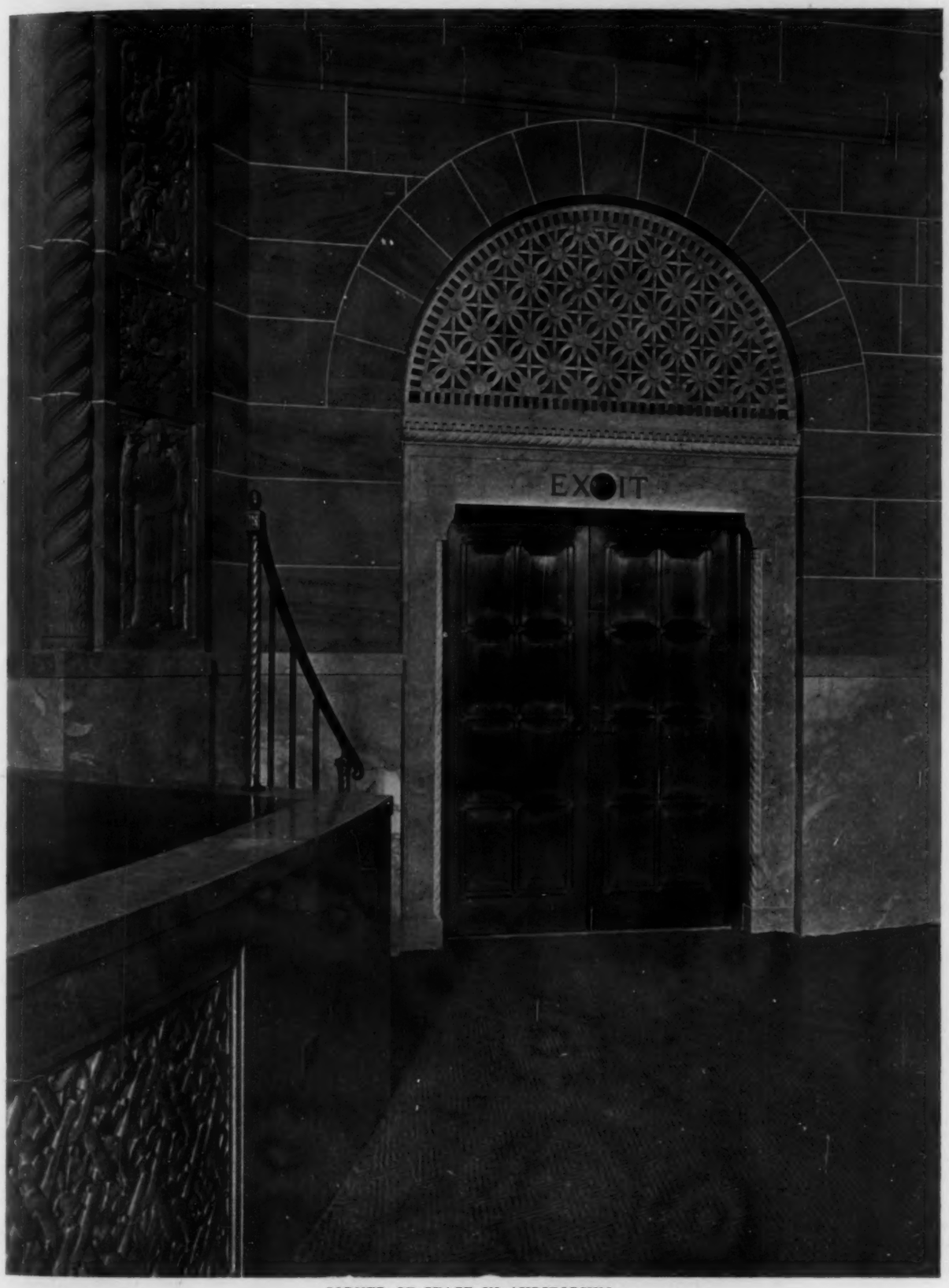
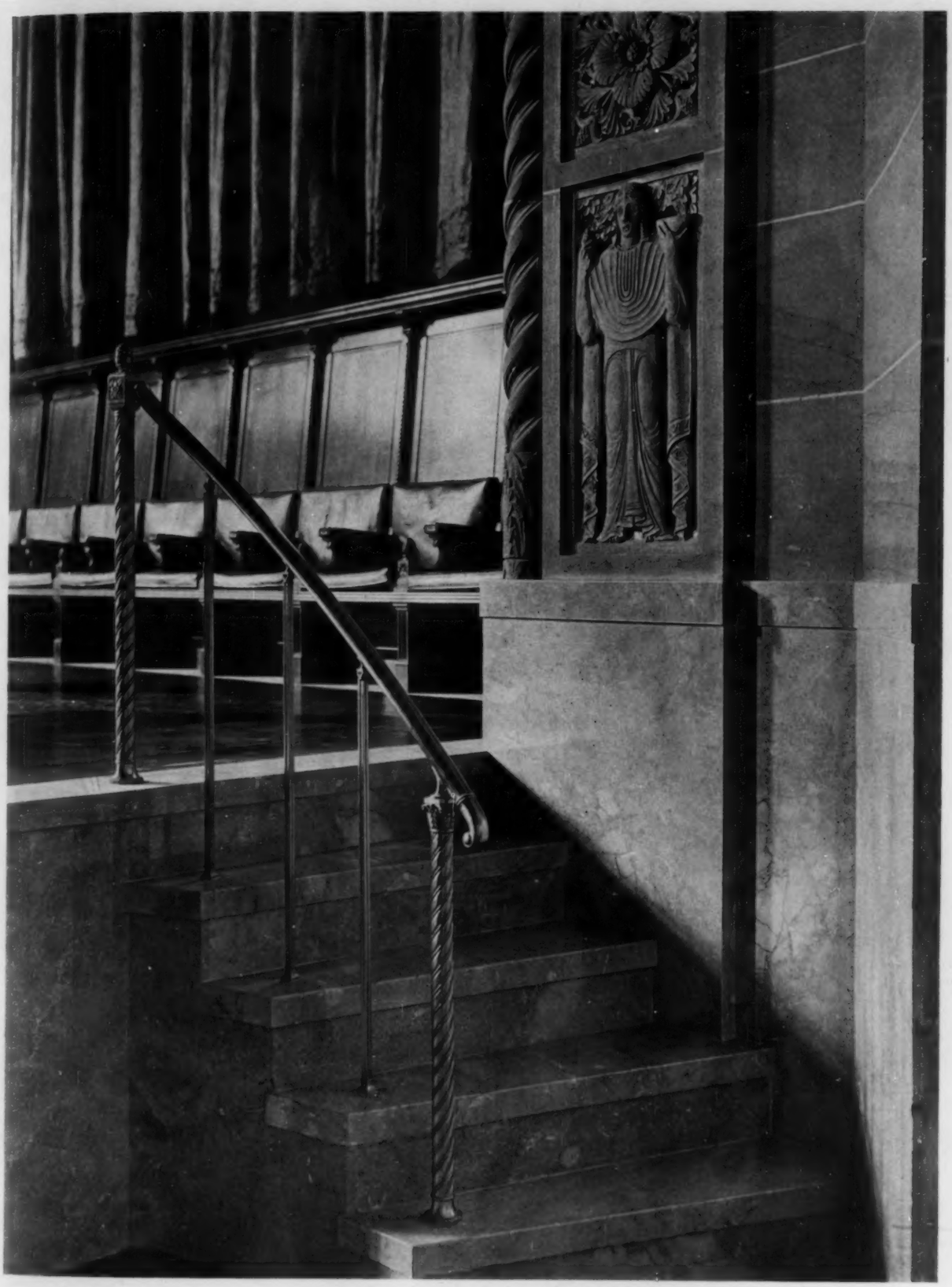
YORK & SAWYER, ARCHITECTS



CORNER OF STAGE IN AUDITORIUM
NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS

UNIV. OF MICH.



STEPS TO STAGE IN AUDITORIUM
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YORK & SAWYER, ARCHITECTS

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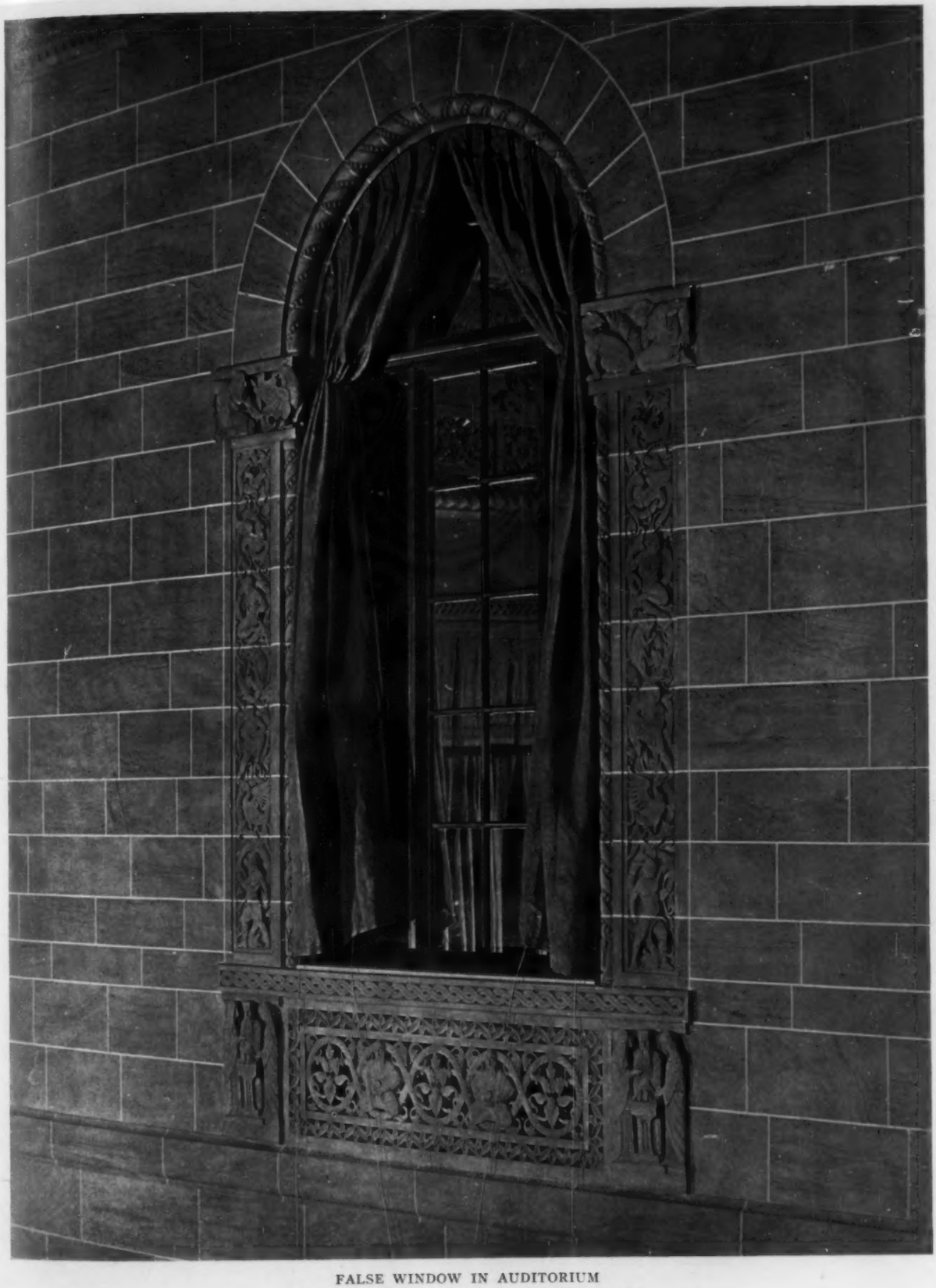

FALSE WINDOW IN AUDITORIUM
NEW YORK ACADEMY OF MEDICINE
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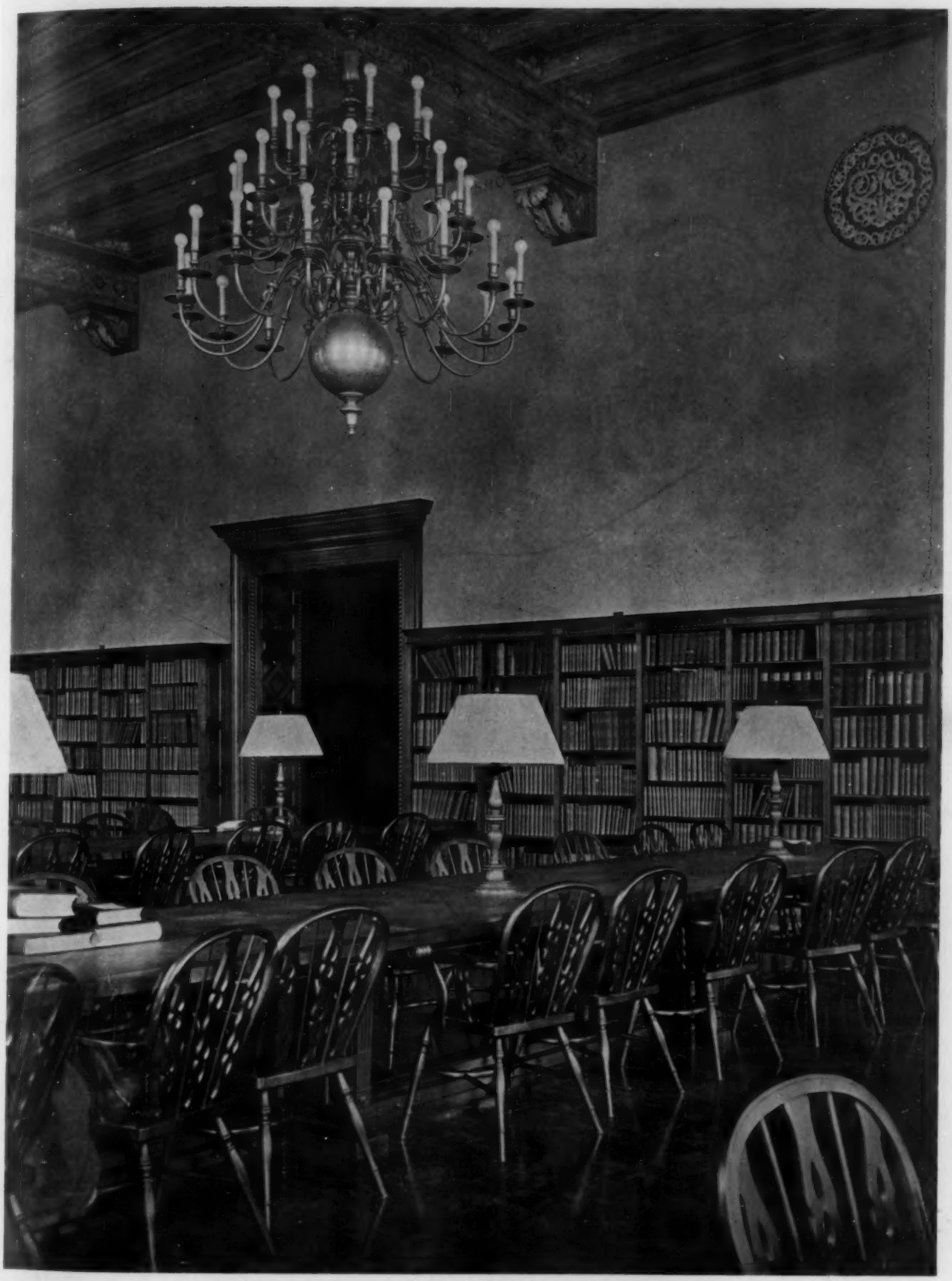
UNIV. OF MICH.



MAIN LIBRARY
NEW YORK ACADEMY OF MEDICINE
YORK & SAWYER, ARCHITECTS

MAIN HALL, TOWARD ENTRANCE DOORS

MAIN HALL, TOWARD ELEVATOR LOBBY

NEW YORK ACADEMY OF MEDICINE

YORK & SAWYER, ARCHITECTS

UNIV. OF MICH.

THE RUE MALLET-STEVENS, PARIS

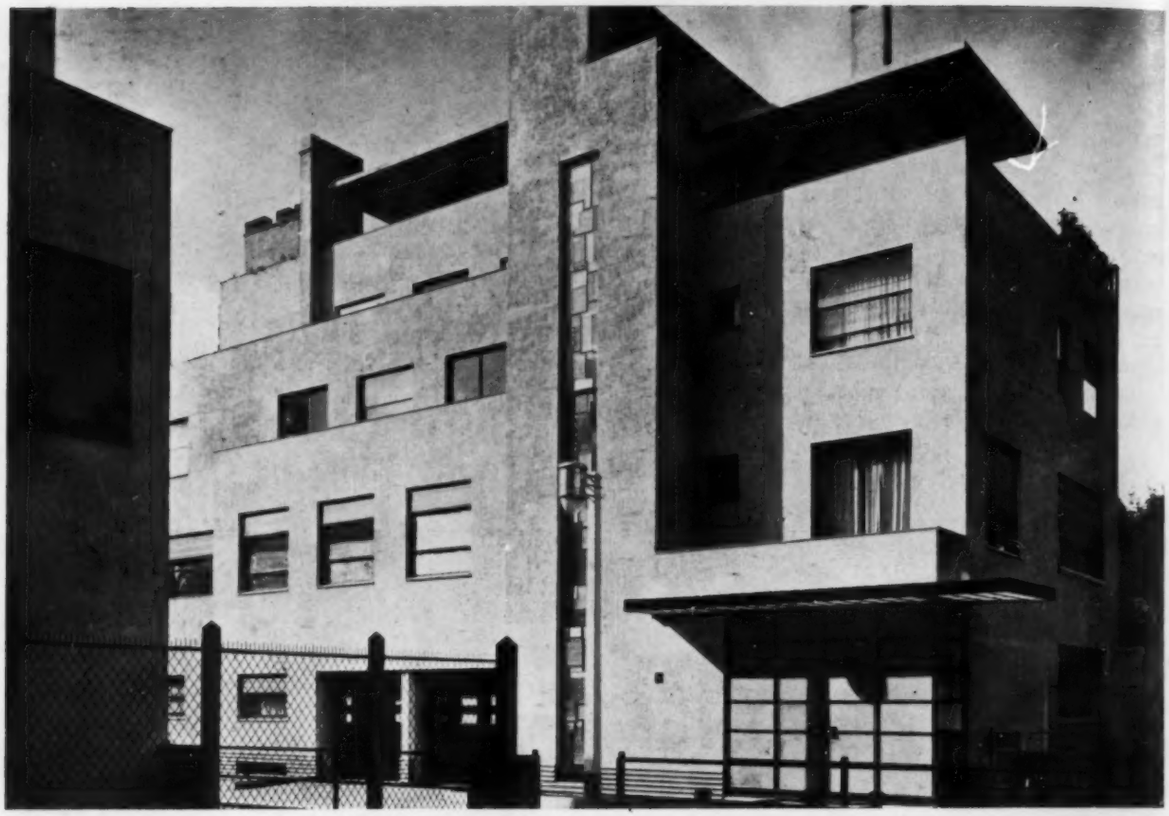
BY

PARKER MORSE HOOPER

SOME call it "futurist," some "cubist" and some "ultra-modern," the style used in the design of the group of houses recently erected on one of the streets in the gay Quartier d'Auteuil by the well known French architect, Mallet-Stevens. The street carries the name of this intrepid designer, who has consistently and logically produced a group of outstanding examples of ultra-modern houses. It is as true of modern architecture as of modern decoration that to be properly appreciated and understood it must stand by itself in its own setting and environment. The flat, angular house, whose only claim to architectural design is in its proportioning and the spacing of its solids and voids, appears at a great disadvantage when surrounded by buildings whose design is based on architectural precedent. The same is true of modern furniture and decoration. They do not mix with the accepted styles of the past. So it was a clever idea of this disciple of ultra-modern architecture to build a street of houses entirely in the modern manner. Don't expect to find in this amazing thoroughfare any of the architectural styles

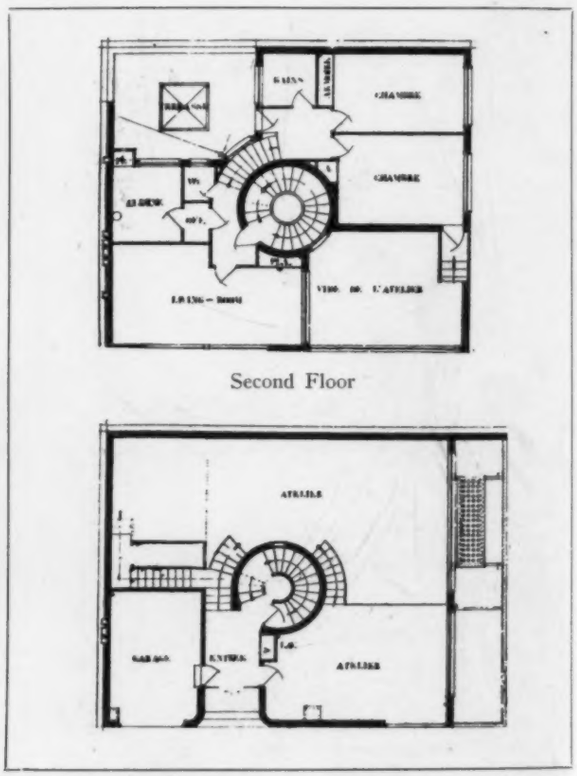
Photos. Bouney

White Cement and Black Iron Railings Give a Nautical Effect to This Two Story Entrance Porch, Rue Mallet-Stevens



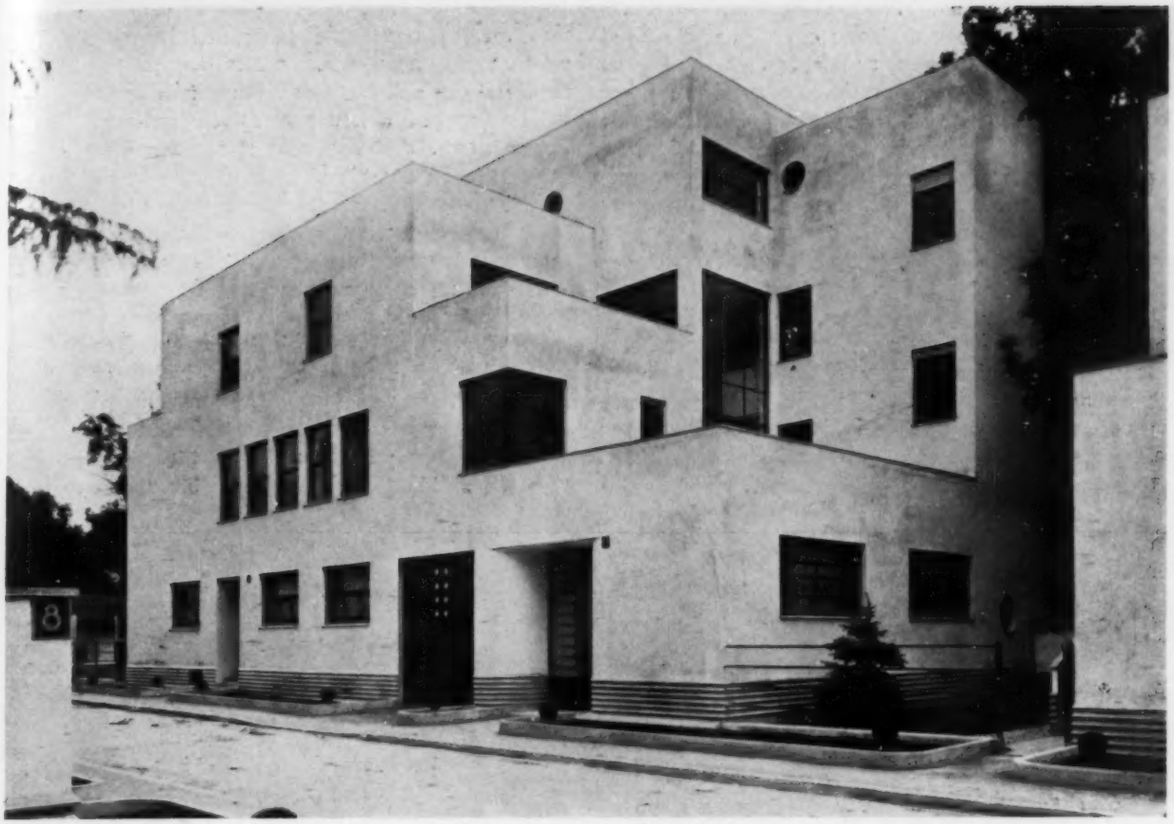
Emphasis on Horizontal and Vertical Lines, and Single Paned, Double Hung Windows Characterize the Design of this Modernist House, Paris, by Mallet-Stevens, Architect

Mallet-Stevens Stands for His Portrait in Front of One of His Modernist Houses

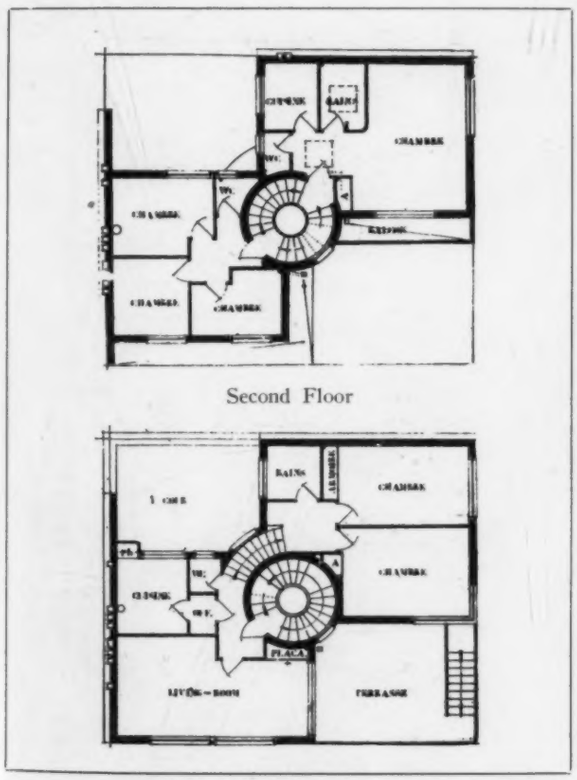


Second Floor

Plans of a Typical House
First Floor



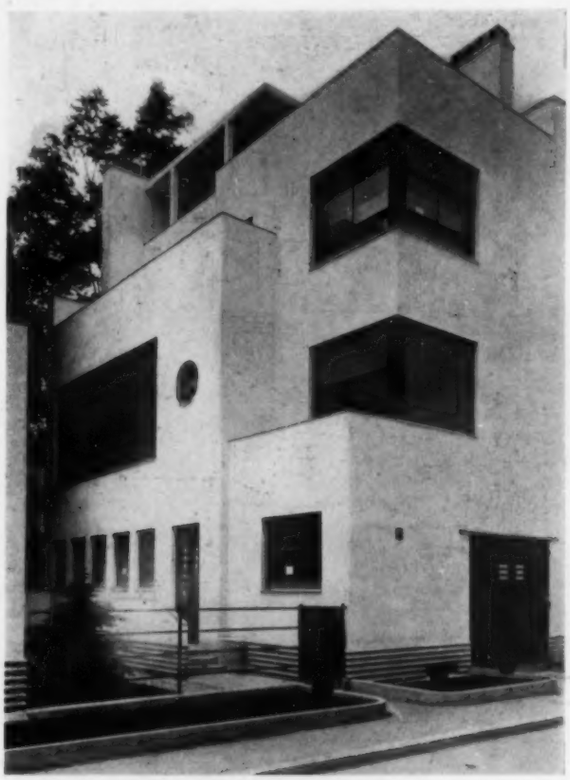
Rear of Typical Right Angle Corner House, Rue Mallet-Stevens, Built by and Named After this Modernist French Architect



Second Floor

First Floor

Plans of a Typical House

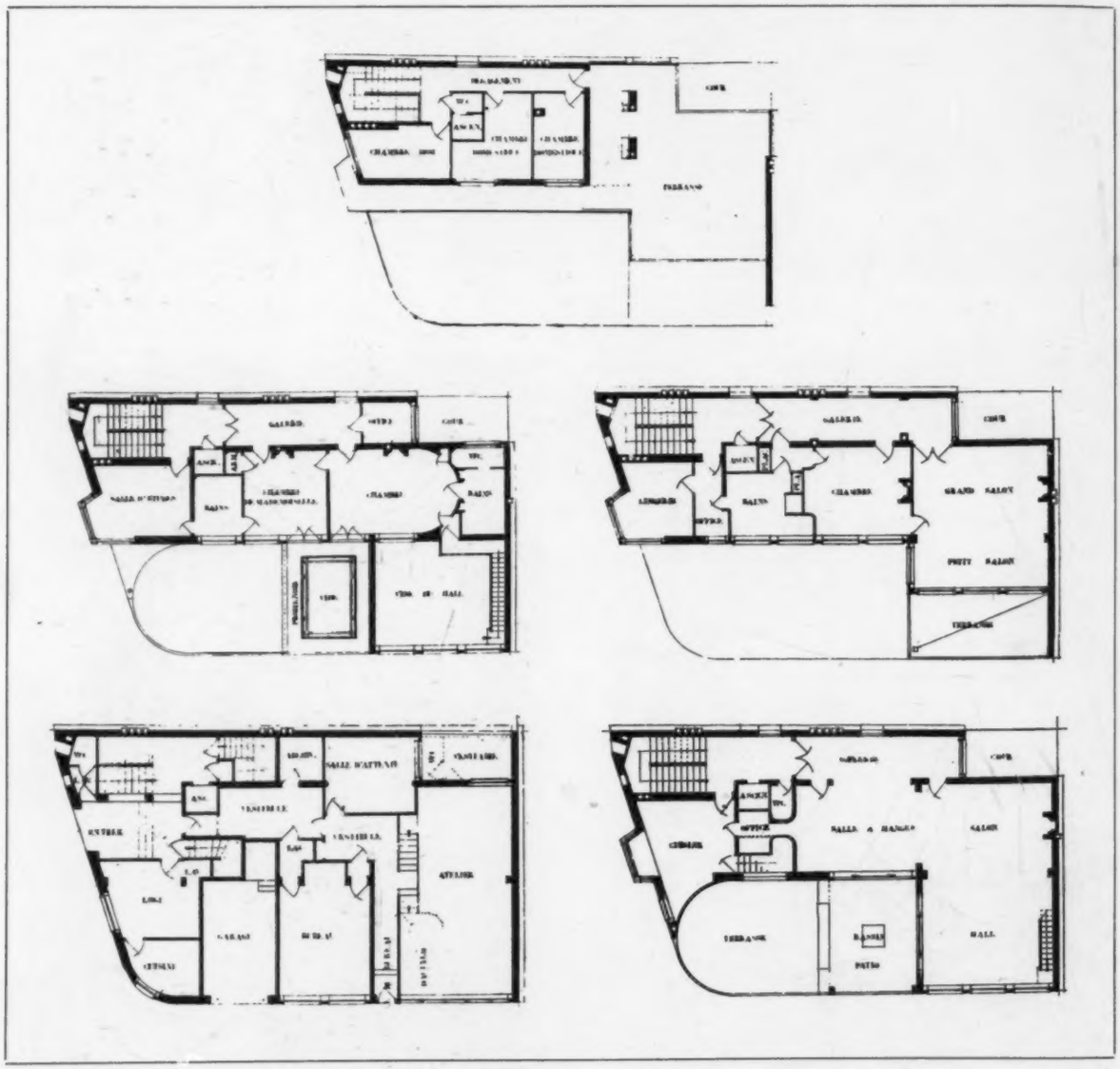


Port Holes and Glassed-in Porches Give the Prevalent Nautical Note to this Modernist House by Mallet-Stevens

or *motifs* of the past. The new architects of Paris are as unwilling to use classic columns and carved cornices as are contemporary poets to sing of brooks and forests! Their inspiration comes from other sources, more in keeping with the commercial age of which these buildings are a concrete expression.

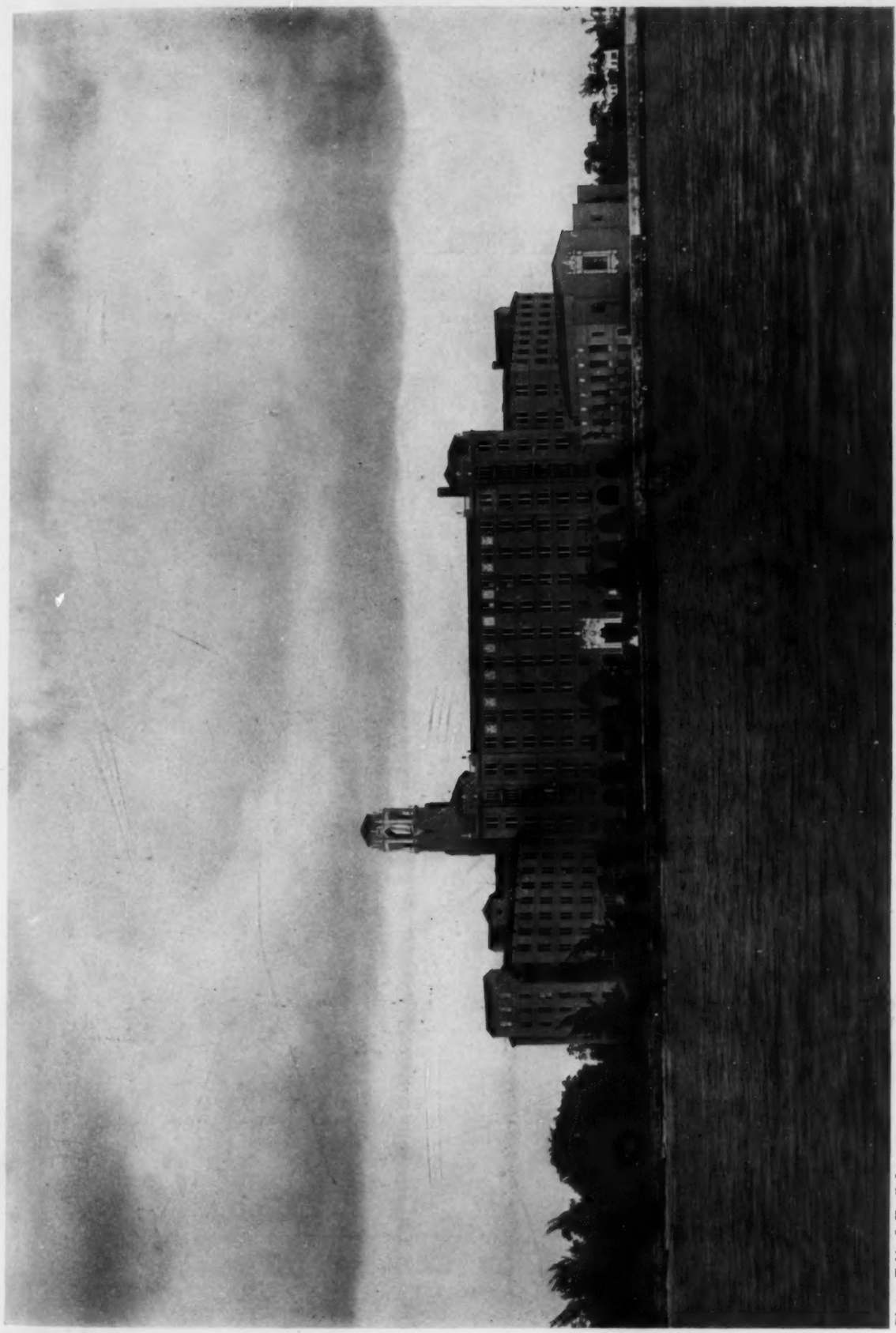
The inspiration of these modern houses is geometry. Rectangles, cubes, cylinders, circles and planes are combined with extraordinary virtuosity to give variety and individuality to these modernistic designs. To the uninitiated and unappreciative the lack of sloping roofs, overhanging eaves and the use of large and small windows, often closely grouped, give the impression that these are industrial rather than domestic buildings. A careful study soon prevents one from long remaining indifferent before these interesting examples of modern architecture. A deeper meaning soon reveals itself. The superposition of cubes and rectangles of varying proportions creates an ensemble of beautiful simplicity. The relation of mass to mass and horizontal line to vertical fully establishes the intention of the architect.

The plan of a house is clearly indicated in the design of the elevation, almost as though each room in its three dimensions were a separate entity and placed above or next to other rooms in such number and arrangement as need and use might determine. It is an architecture of three dimensions. It is the zoning law applied to dwelling houses as well as to skyscrapers. It is the forerunner and will be the inspiration of the New York houses of the future under the new dwellings law. Whether or not we are at first shocked by the bareness, the angularity and the austerity of these modern French houses, the day is not far distant when these stepped and terraced buildings will be acceptable and agreeable.



Plans of a Typical Five Story Modernist House, Rue Mallet-Stevens, Paris

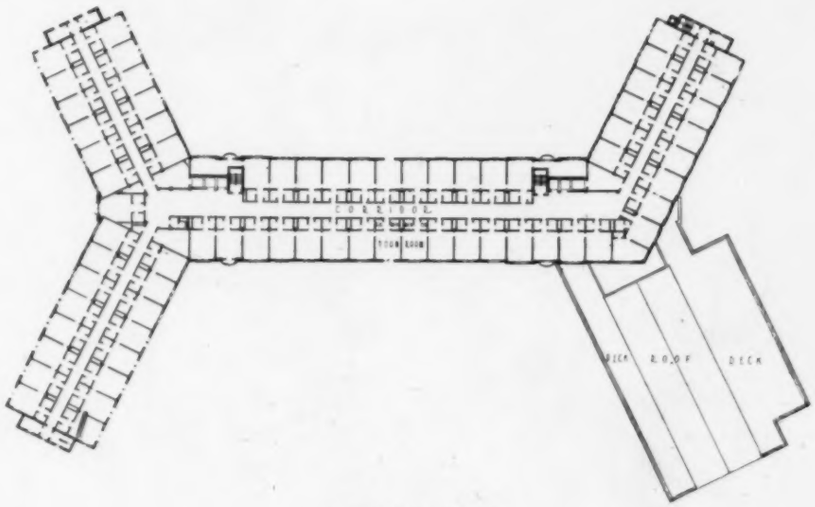
Mallet-Stevens, Architect



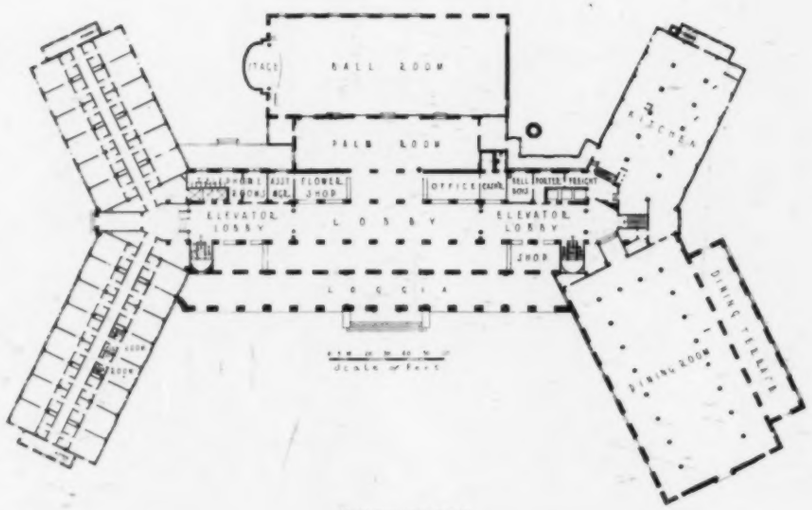
VINOY PARK HOTEL, ST. PETERSBURG, FLA.
HENRY L. TAYLOR, ARCHITECT

Photos. Tebbs & Knell, Inc.

Plans on Back



A TYPICAL FLOOR



FIRST FLOOR

PLANS, VINOY PARK HOTEL, ST. PETERSBURG, FLA.
HENRY L. TAYLOR, ARCHITECT

SOUTHERN WING

VINOY PARK HOTEL, ST. PETERSBURG, FLA.

HENRY L. TAYLOR, ARCHITECT

MAIN ENTRANCE

VINOY PARK HOTEL, ST. PETERSBURG, FLA.

HENRY L. TAYLOR, ARCHITECT

MAIN LOBBY

VINOY PARK HOTEL, ST. PETERSBURG, FLA.

HENRY L. TAYLOR, ARCHITECT

ENTRANCE TO BALL ROOM

VINOY PARK HOTEL, ST. PETERSBURG, FLA.

HENRY L. TAYLOR, ARCHITECT

UNIV. OF MICH.

DINING ROOM
VINOY PARK HOTEL, ST. PETERSBURG, FLA.
HENRY L. TAYLOR, ARCHITECT

PALM ROOM

VINOY PARK HOTEL, ST. PETERSBURG, FLA.

HENRY L. TAYLOR, ARCHITECT

DINING ROOM

BALL ROOM

JVINOY PARK HOTEL, ST. PETERSBURG, FLA.

HENRY L. TAYLOR, ARCHITECT

PROPRIETY AND VARIETY IN THE GEORGIAN MANNER

A HOUSE AT HARTFORD

PHILIP L. GOODWIN, ARCHITECT

ONE of the most amazing things about Georgian architecture is the almost limitless scope of interpretation it permits both in the matter of composition and in respect of detail. If ever a mode has suffered from attempts to shackle it and confine it in a straitjacket of arbitrary conventions, it is the Georgian mode. From the time of Lord Burlington and his Palladian coterie right down to the present day, restrictive influence has been at work in one way or another. And yet the vitality of the Classic manner is not to be downed; it always re-asserts itself and gives fresh evidence of its inherent elasticity and fitness for clothing fresh conceptions.

There is just as much latent possibility in the Classic field,—Georgian and pre-Georgian,—as there ever was, and just as much scope for the play of ingenious invention without transgressing the proprieties. What man has done, man can do; and what the architects of the seventeenth, eighteenth and early nineteenth centuries did in the way of creating varied interest of composition and treatment of detail, the architects of the present generation may do again if they choose to approach the subject with the same readiness of enthusiasm and the same spontaneity of imagination as did their predecessors. The way lies open; the will alone is needed to follow it to success. If the architect is thoroughly imbued with the Classic spirit and loyal to its doctrines, he may reserve to himself the liberty of blazoning the letters in a justifiably human and non-pedantic manner. So long as he recognizes and adheres to the fundamental *principles* of the mode in which he is working, he is free to heed the promptings of a vigorous though disciplined imagination in working on those principles, in brick and stone and wood. He will then discover that the mode supplies him with a plentiful repertoire of forms and precedents which he can adapt and combine and modify as fancy and occasion may dictate, so long as he does not contravene the principles upon which the mode is

House of James L. Goodwin, Esq., Hartford
Philip L. Goodwin, Architect

Detail in Main Hall

based. He will realize, too, that composition and detailing in the Classic mode need never be a poverty-stricken performance of fossilized conventions.

While a due recognition of the foregoing truths is of general pertinence to the employment of the Georgian mode anywhere, it is of particular importance to any architect using that mode in Connecticut. In no part of America is local Georgian tradition more firmly entrenched amid time-honored sanctions than in Connecticut. Nowhere is it more jealously regarded with deep respect; and it is right that this should be so, for the Connecticut version of the Georgian domestic manner is notably good. Any least departure from local precedent has therefore to be managed with considerable tact to avoid the risk of bringing in an element discordant with what is already in the field. It is not like going into a fresh territory, where one can, so to speak, create usage and establish precedent. There is always peril in putting "new wine into old bottles." Connecticut local Georgian tradition is so good, so strongly characteristic, and so prevalent that any noticeable departure therefrom, however excellent it be *per se*, is likely to be out of place. Nearly every old Connecticut village, in fact, is so deeply stamped with the hallmarks of local tradition that its homogeneous Colonial and Georgian atmosphere is not seriously to

Dining Room, House of James L. Goodwin, Esq., Hartford
Philip L. Goodwin, Architect

be disturbed even by the mid-Victorian crudities that once managed to edge themselves in as parvenus among their architectural betters. These present, at least, a certain uniformity of materials and color with the traditional types that helps to mitigate the discordance of their design; time has mellowed them, and the kindly growth of trees and shrubbery has further served to soften the harshness of their lines and in a measure to reconcile the eye to their presence.

Under the circumstances, then, this house at Hartford acquires a new angle of interest. As a piece of Georgian design it adheres sufficiently closely to Connecticut usage to satisfy rather exacting sanctions, and yet at the same time it embodies features that carry a completely fresh accent. The most noteworthy of these features are to be found in the extension from the main block of the dwelling comprising the service wing and garage, the sleeping porch contrived immediately above a half-hexagon bay on the ground floor, and the treatment of certain decorative details in the main hall and in the woodwork of the dining room. The service wing and garage are distinctly suggestive of Regency methods in the general proportions of their masses, in their stuccoed walls, and in much of the detail that marks their character. At the same time, they exhibit a flavor of French precedent that is happily combined with

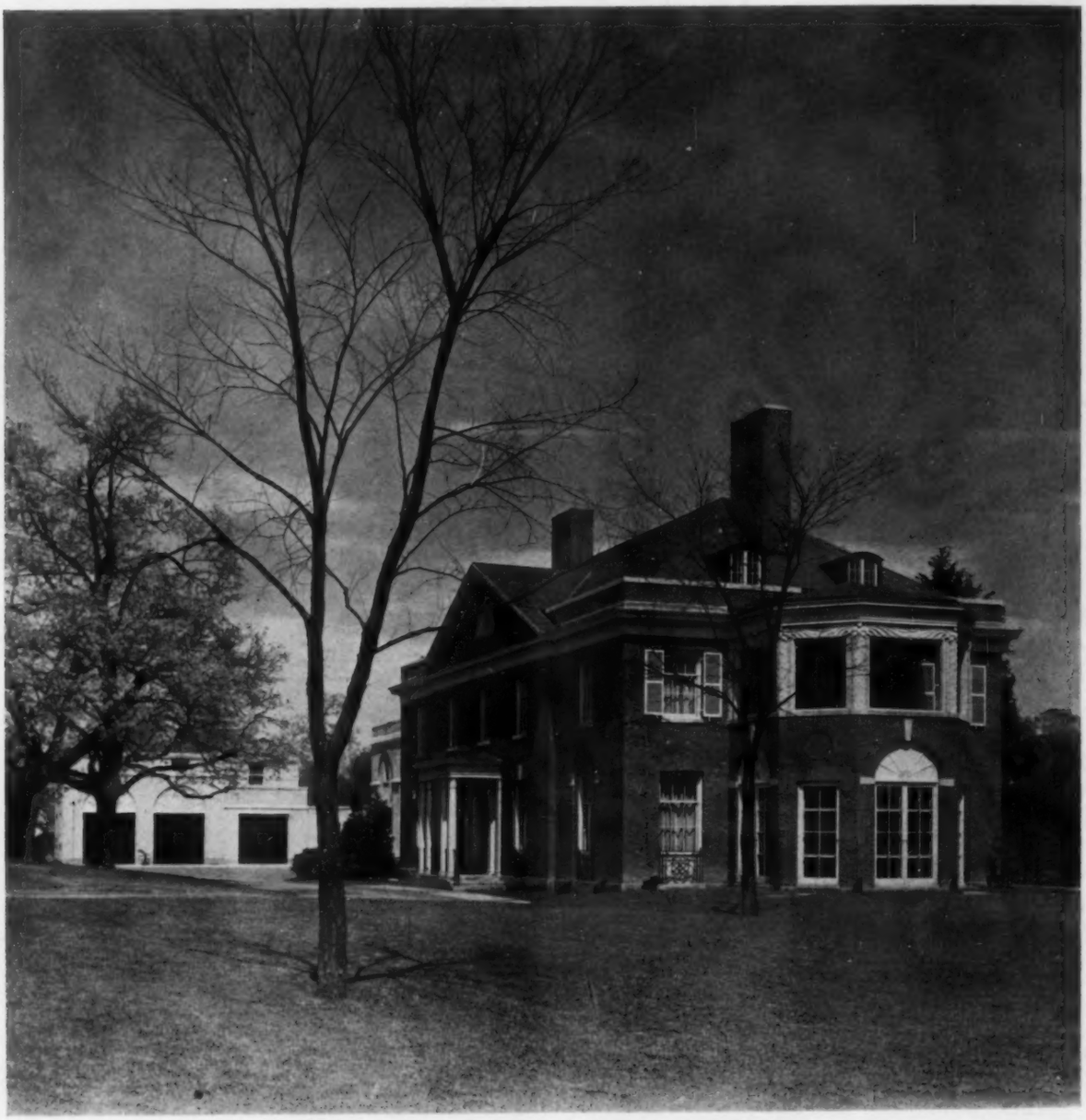
Detail of Terrace Entrance

Dining Room, House of James L. Goodwin, Esq., Hartford

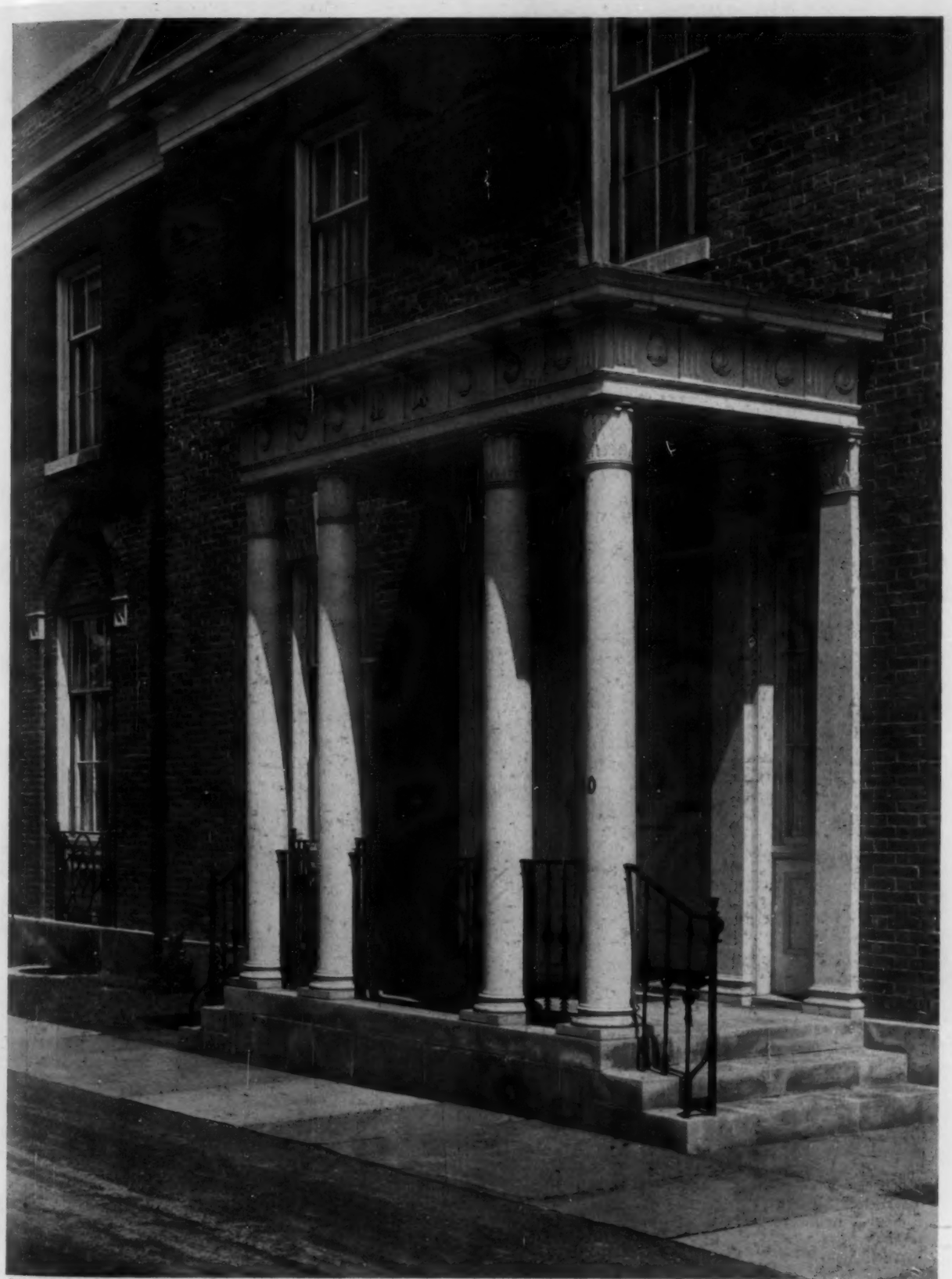
Philip L. Goodwin, Architect

their otherwise early nineteenth century British and American quality, a combination seen in certain old houses and always possessing elements of interest.

A sleeping porch, especially when it is obtruded on a Georgian design, is generally a *bete noir* and an eyesore as well; and it is nearly always an ultimately needless source of distress to the architect and the public eye, because a client rarely makes continued use of this deformity after he gets it. Nevertheless, Mr. Goodwin has contrived to make the sleeping porch in this instance not only as unobjectionable as possible but he has also managed to invest it with an appreciably individual interest. The very original method of ornamenting the piers will go far to divert mind and eye from the structural void behind. The arrowhead *motif* on a colored ground that appears in the pilaster panels of the dining room doors, the pattern of the paneled dado with its triple sinkages, design of the dining room cornice, and the late neo-Classic quality of the woodwork and plaster ornament in the entrance hallway are all items of interior decorative architecture that exhibit original characteristics and may be examined with both interest and profit. The whole composition creates a pleasant sense of fitness to environment. This fact is perfectly patent from the illustrations, but, further than that, it is marked by considerate regard for regional sensibilities without surrendering liberty of action in either the major elements of design or in detail. The character of the house is considerably strengthened by thoughtful decorating and careful furnishing, which of course add much to its interest.



General View, House of James L. Goodwin, Esq., Hartford
Philip L. Goodwin, Architect

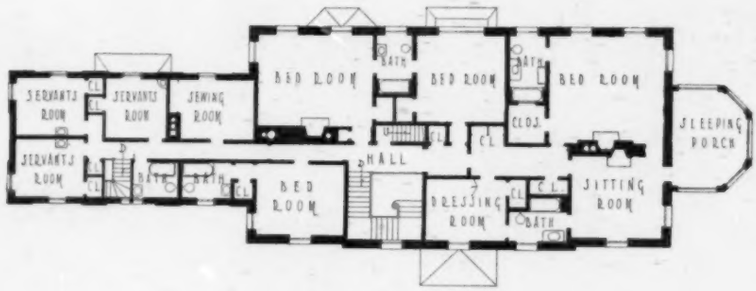


Photos. Amemya *Plans on Back*

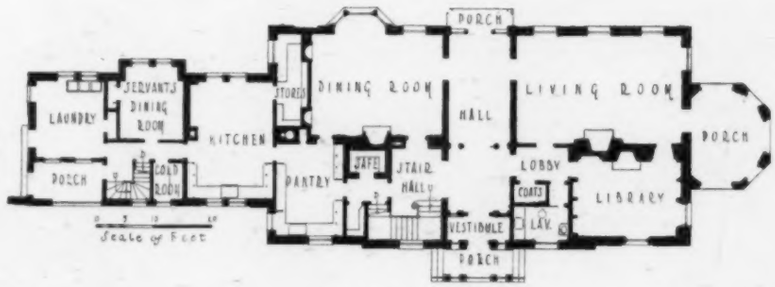
ENTRANCE PORCH

HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD

PHILIP L. GOODWIN, ARCHITECT



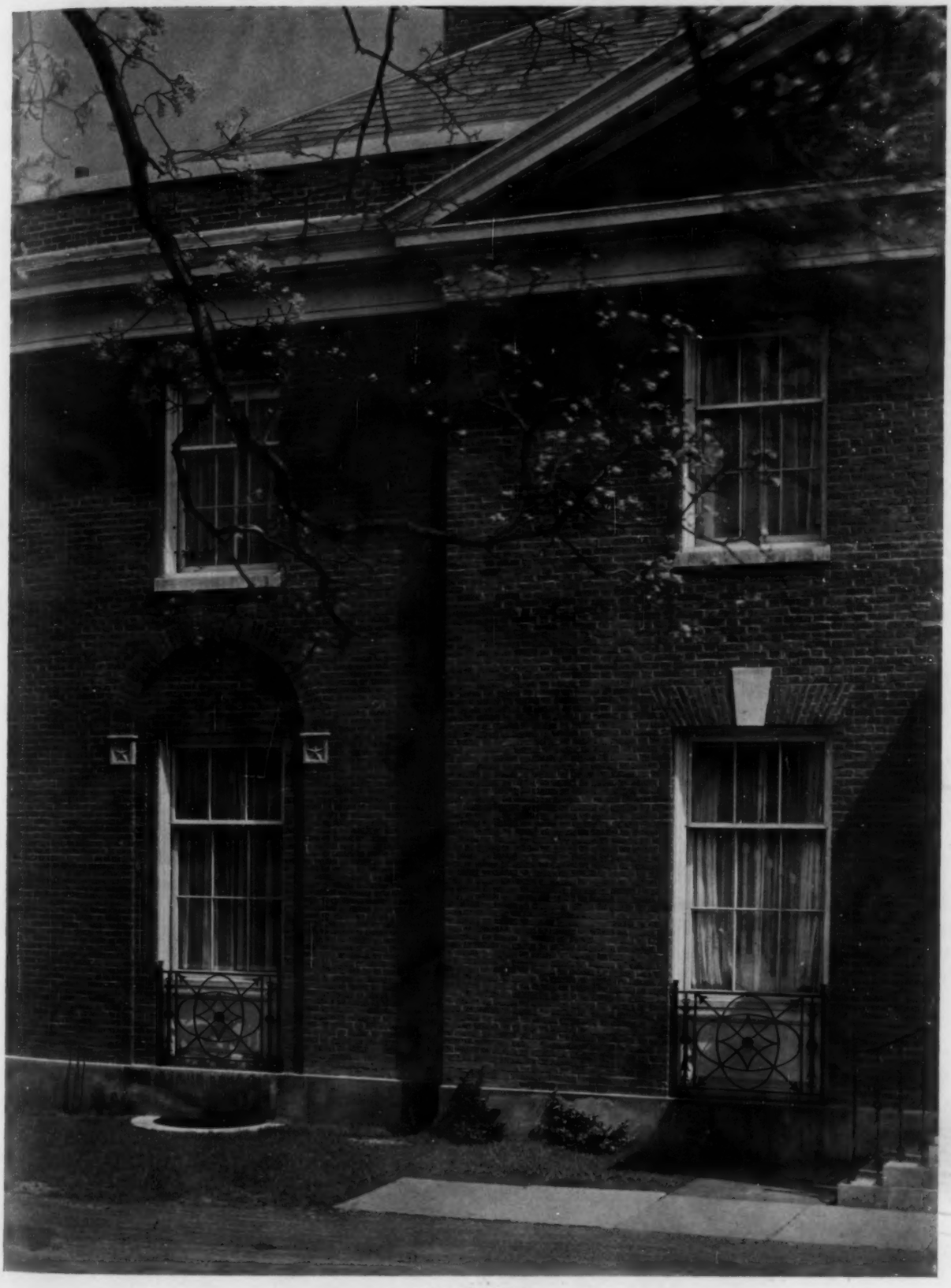
SECOND FLOOR



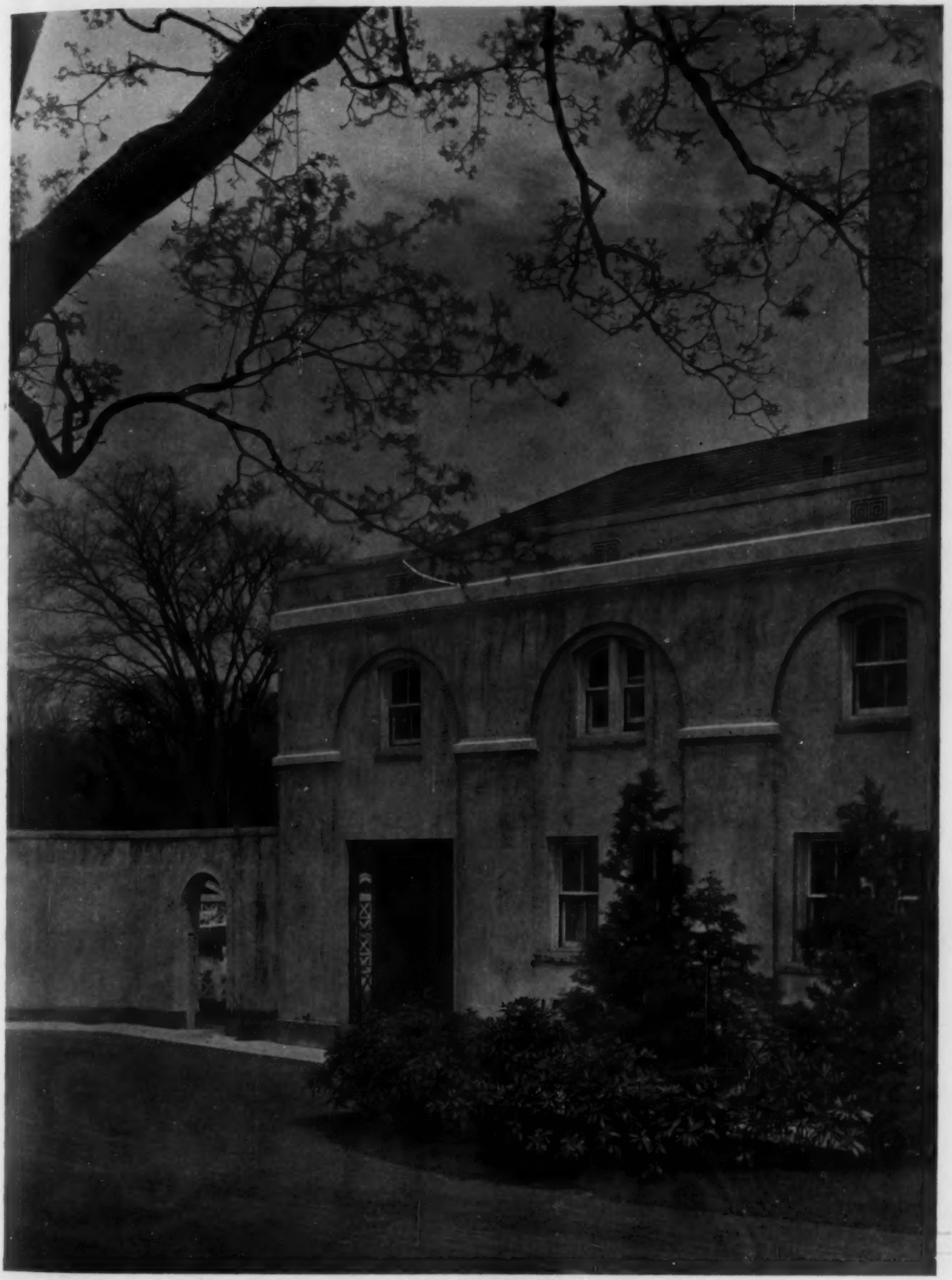
FIRST FLOOR

PLANS, HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT

Editor's Note. Measured Details Will Be Published in THE ARCHITECTURAL FORUM for May



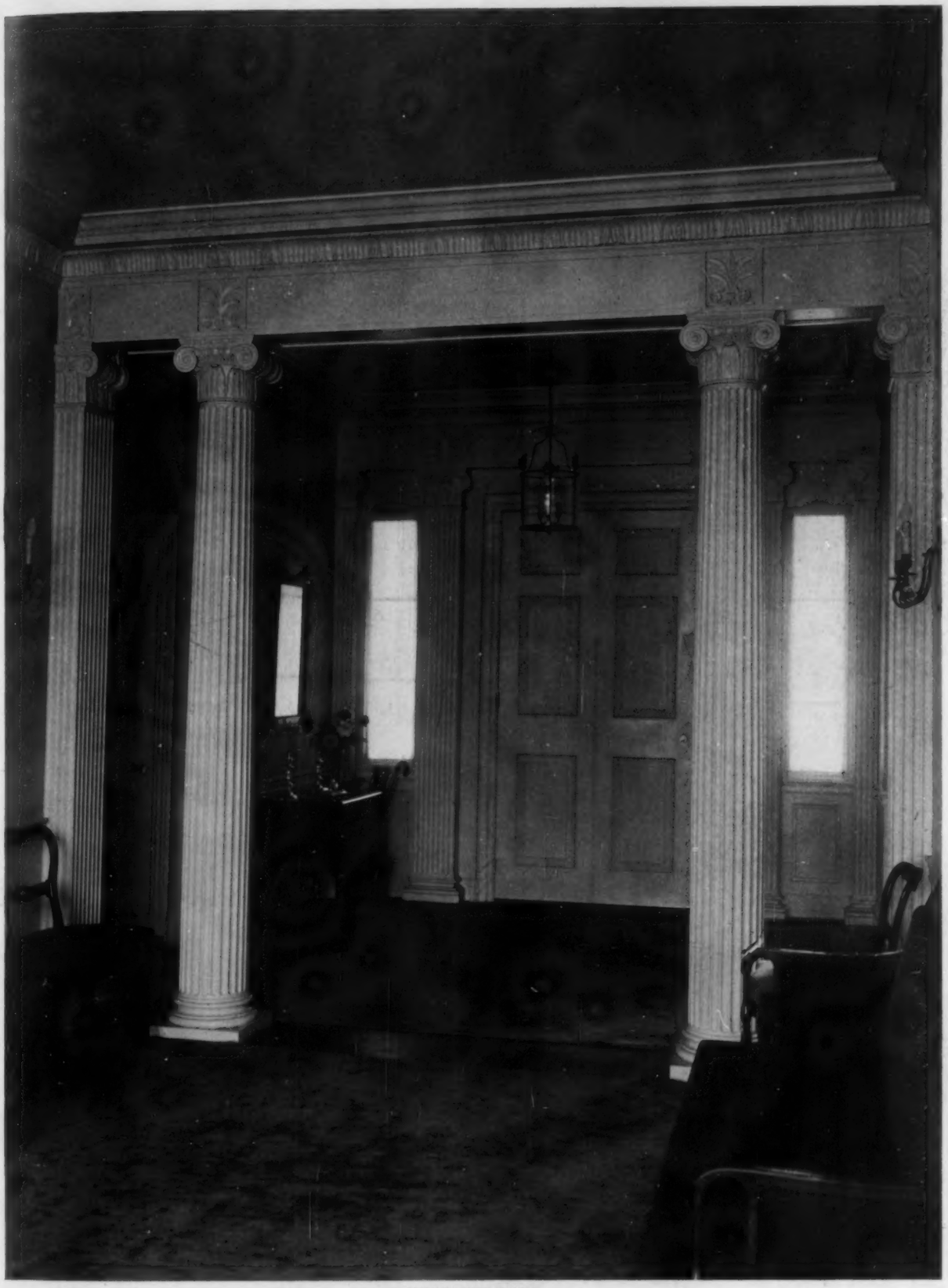
MAIN FACADE
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT



SERVICE WING

HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD

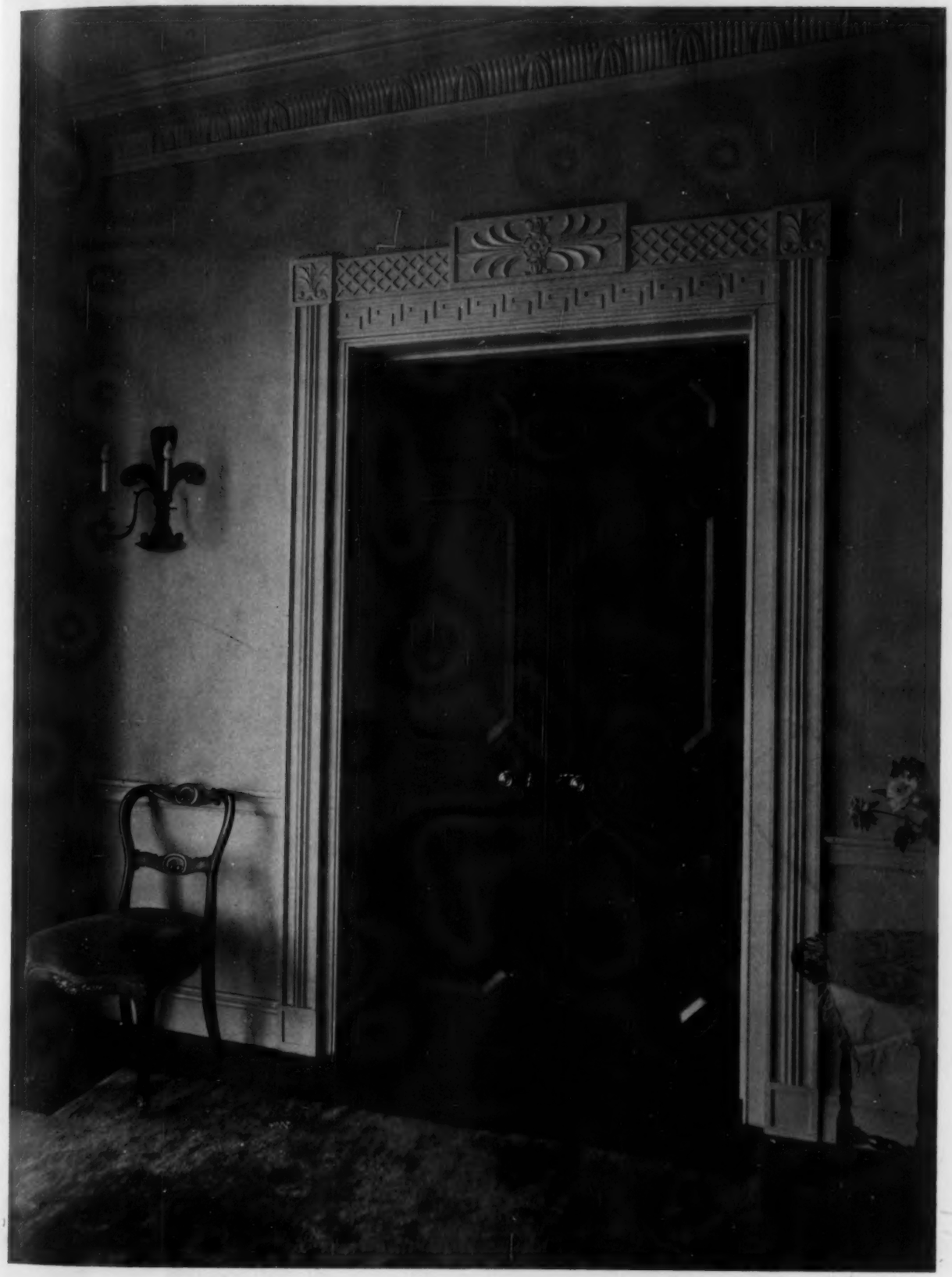
PHILIP L. GOODWIN, ARCHITECT



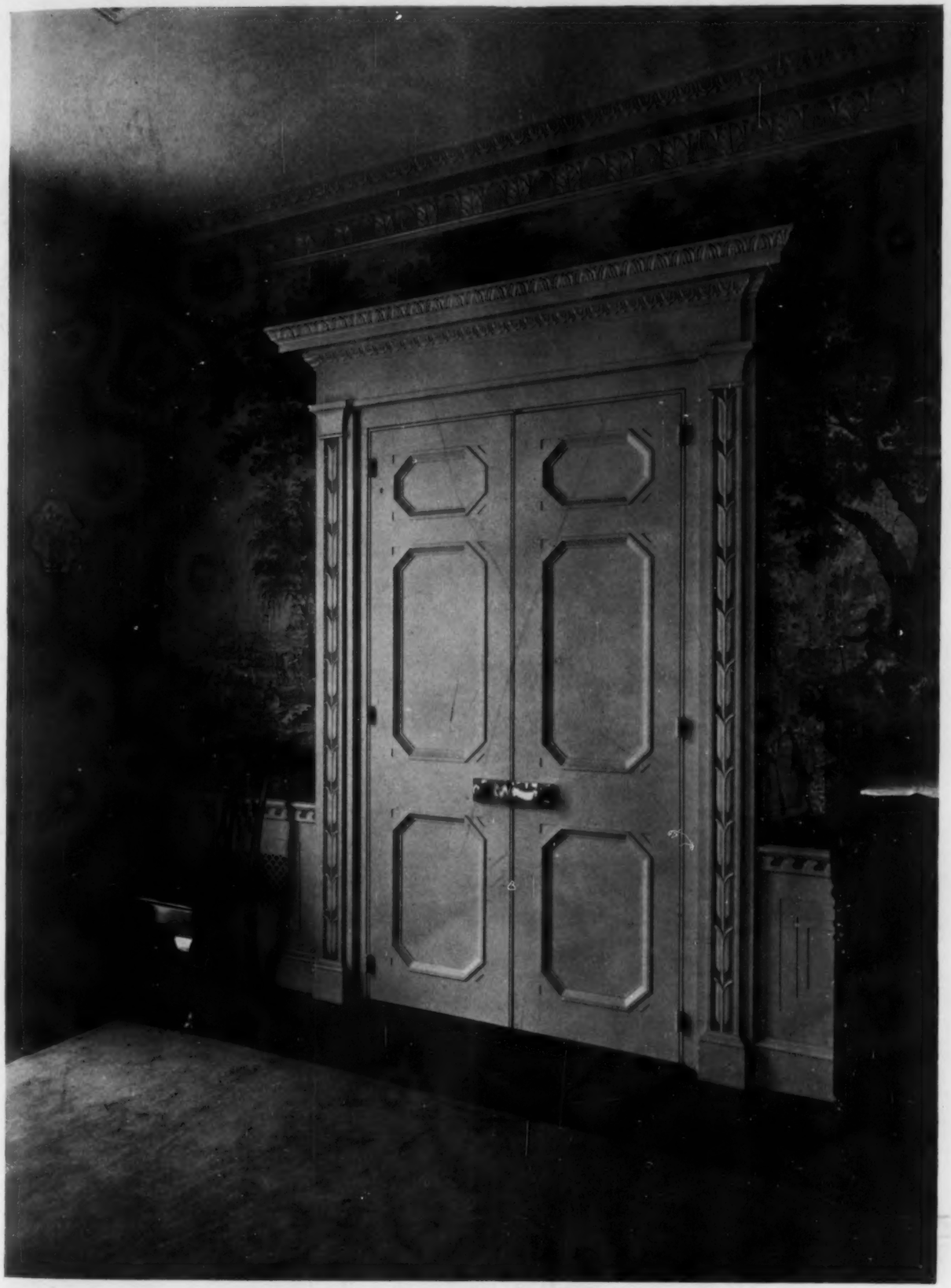
ENTRANCE HALL

HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD

PHILIP L. GOODWIN, ARCHITECT



LIVING ROOM DOOR
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT



DINING ROOM DOOR
HOUSE OF JAMES L. GOODWIN, ESQ., HARTFORD
PHILIP L. GOODWIN, ARCHITECT

UNIV. OF MICH.

CONCOURSE FACADE

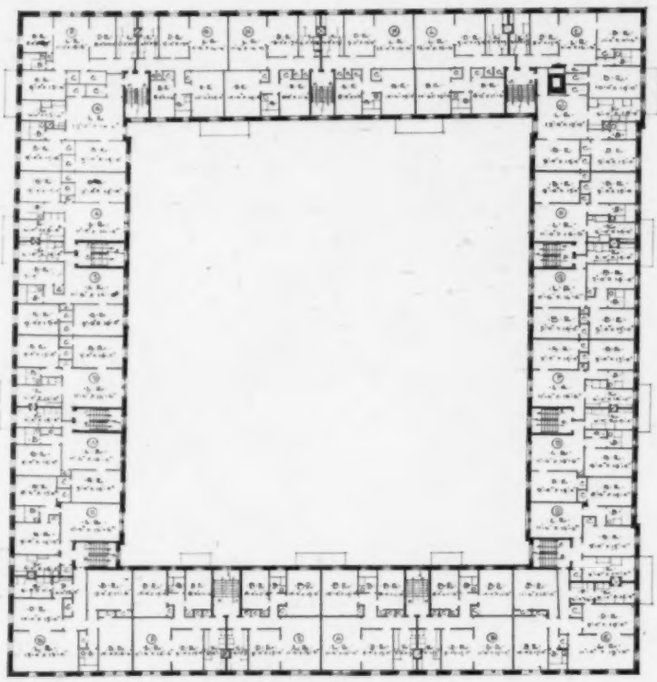
Photos. Kenneth Clark

COURT FROM ENTRANCE DRIVEWAY

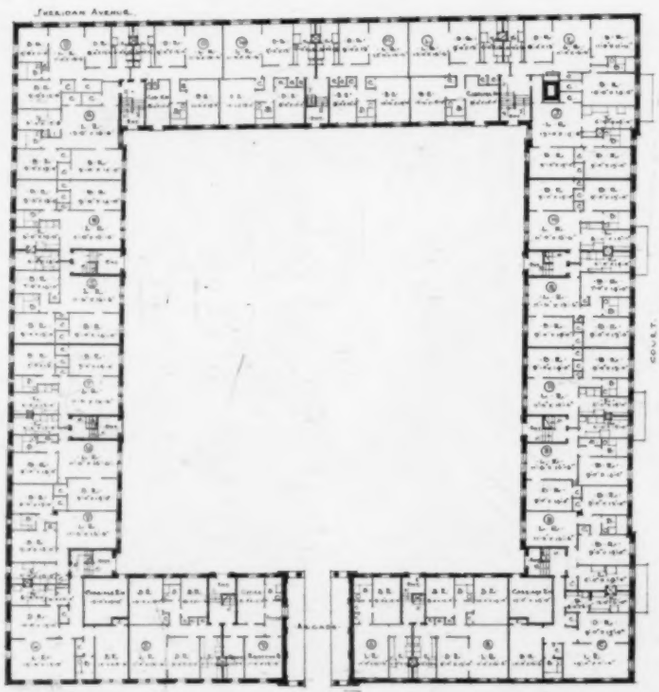
Plans on Back

ASTOR CONCOURSE APARTMENTS, NEW YORK

AYMAR EMBURY II, ARCHITECT



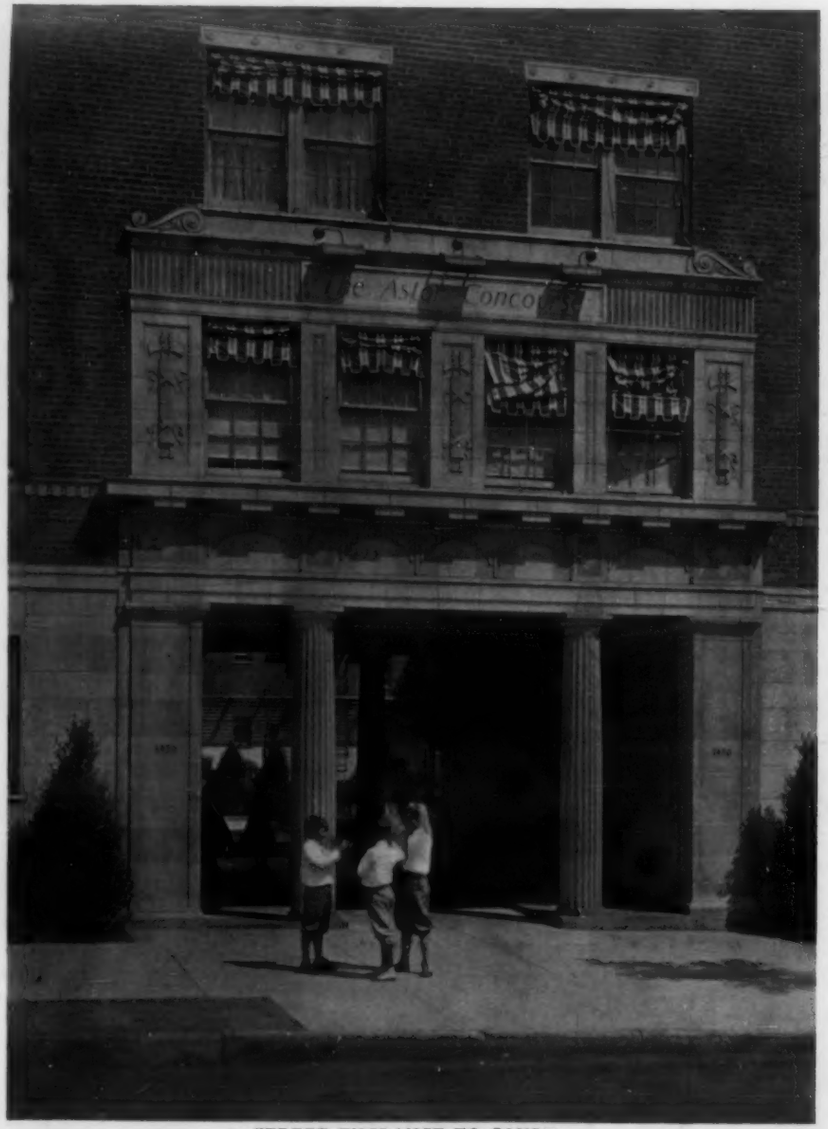
A TYPICAL FLOOR



FIRST FLOOR

PLANS, ASTOR CONCOURSE APARTMENTS, NEW YORK
AYMAR EMBURY II, ARCHITECT

EDITOR'S NOTE. Awarded Honorable Mention, in the Six Story Apartment House Class at the Recent Annual Meeting of the New York Chapter of the Amer.can Institute of Architects



STREET ENTRANCE TO COURT

DOOR TO APARTMENTS IN COURT

ASTOR CONCOURSE APARTMENTS, NEW YORK

AYMAR EMBURY II, ARCHITECT

AN ARCHITECT IN MOROCCO, PART I

BY
EUGENE F. KENNEDY, JR.
ROTCH TRAVELING SCHOLAR

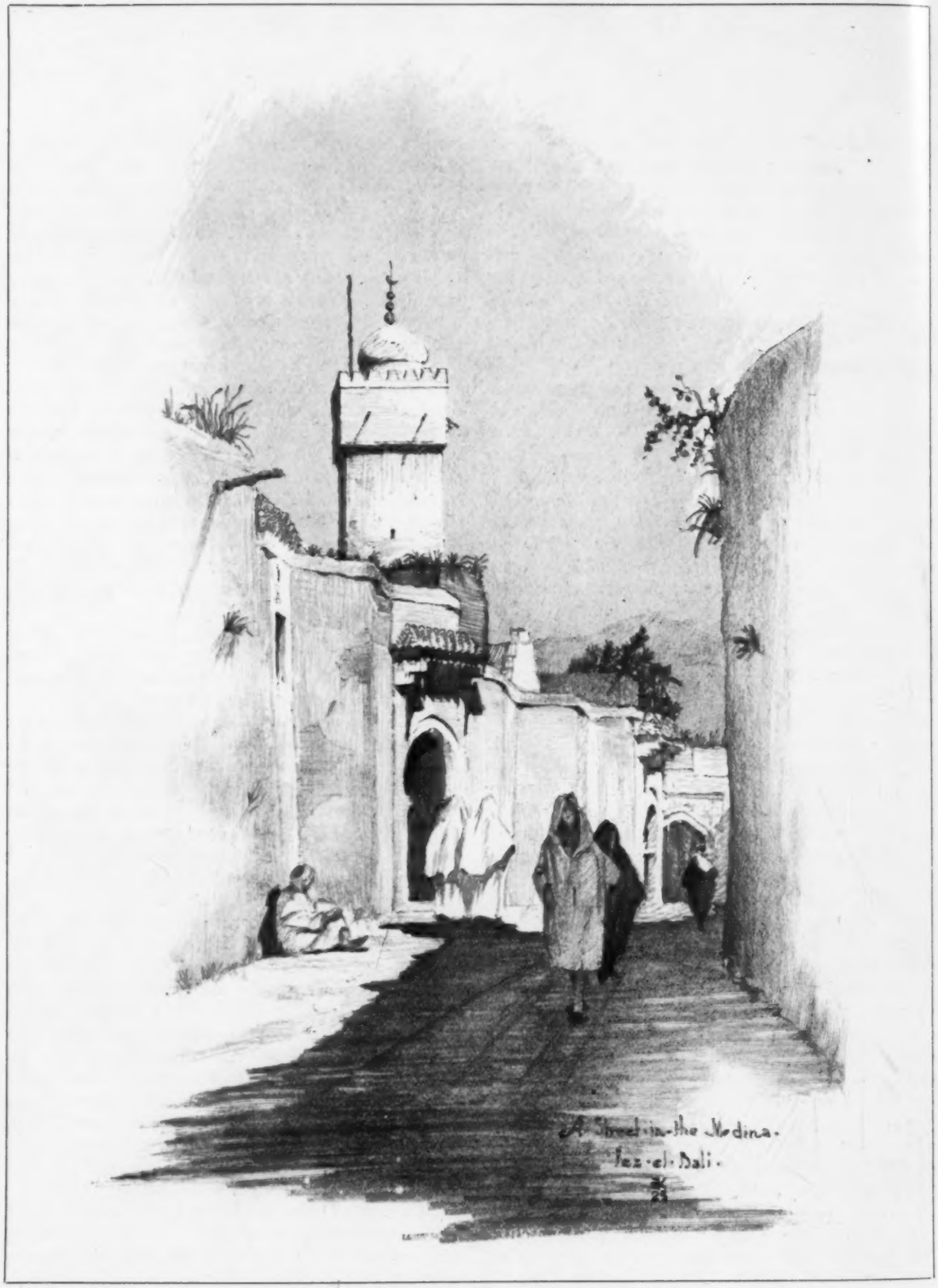
FEW corners of the old world remain unknown to the American architect and architectural student. In traveling abroad they have visited the most obscure places in their indefatigable search for romance, adventure, new ideas or inspiration. Their infinite curiosity has taken them to lands strange to the everyday tourist, and to towns and hamlets unheard of in countries that are comparatively well known. They have long ago ventured into northern Africa. Tunis and Algeria, as well as Egypt, are rarely omitted from their itinerary.

There remains, however, a new land, strange and fascinating, that lies but few miles south of Gibraltar and adjoins Algeria on the east,—Morocco, which but few have ventured to visit. Perhaps this is not to be wondered at; certainly the traveling conditions, even of today, leave much to be desired, especially to one traveling *a l'etudiant*, when one's pockets are not overlined with gold, and the practice of economy does not permit the best obtainable in hotels. Then again, this land has only recently been opened to the tourist, although it was conquered by the French in the not distant past of 1912. The advent of the World War left no room for thoughts of architectural exploration, nor did a certain Mr. Abd-el-Krim make it a safe place for the peaceful brush wielder, when he decided it was about time for another war. However, now that Mr. Krim is safely but a romantic memory, I venture to suggest it as a fitting addition to the itinerary of those who are planning a tour of the old world and who wish to wander from the beaten track of the Cook's tourist.

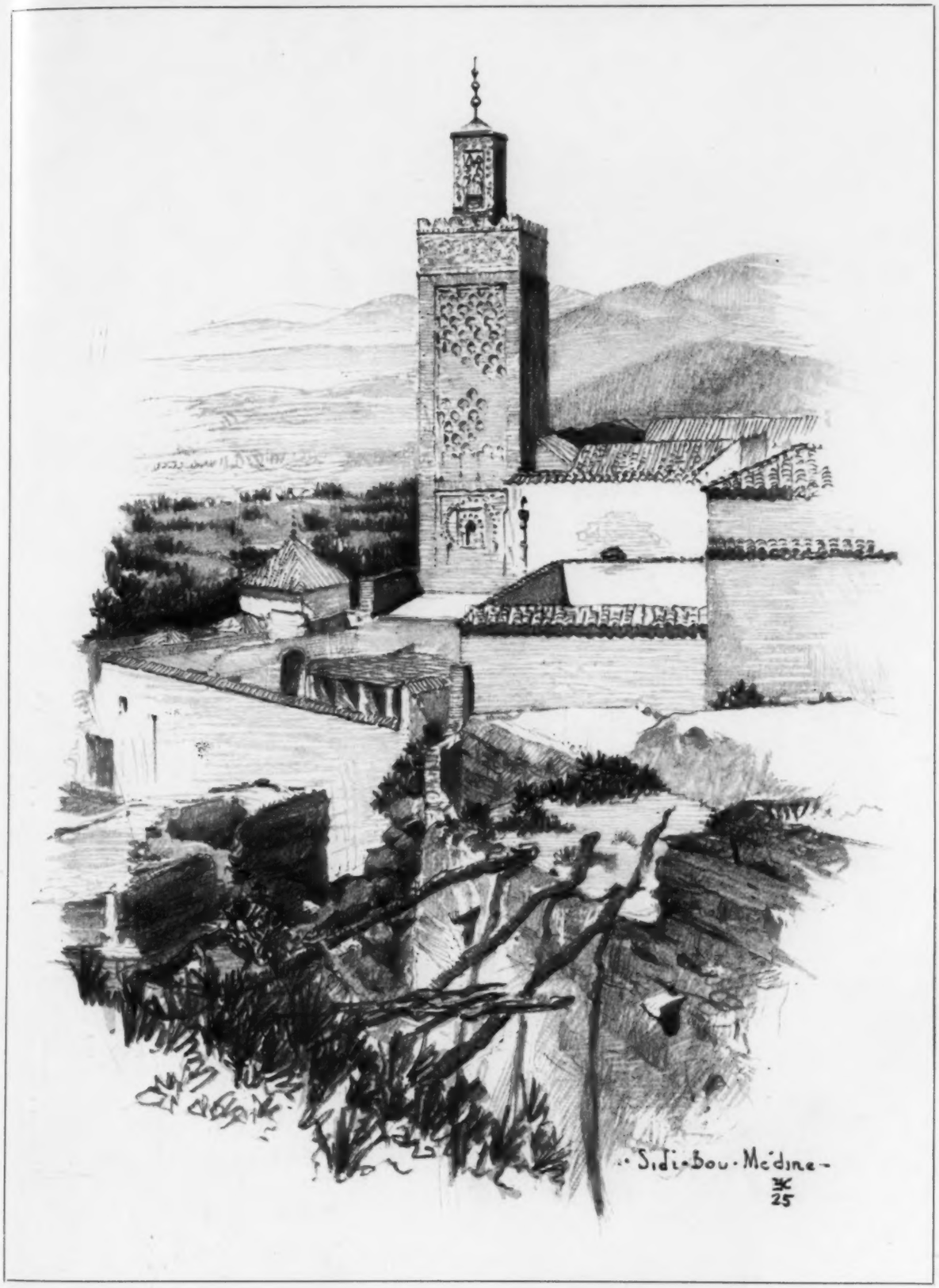
In rendering an account of its strange people, fascinating customs, and exotic architecture, it may be well to start not at the very borders of Morocco, but a few leagues eastward,—in Algeria, where my trip started, and where it is likely any trip may start. Oran, in Algeria, is the French Mediterranean port of Morocco, though in itself it has nothing of uncommon interest to offer those who have visited the cities of Tunis and Algiers,—more magnificent and quite as picturesque,—but it is from here that we embark westward for Tlemcen, on the first lap of our trip to the land of the Moors.

The train carries us through a stern, rugged country, strangely unlike the calm, voluptuous Africa of our imagination, and comparable in severity only to the Andalusian mountain districts of Spain. Here we cross a barren plain, there we slowly climb the slope of a steep mountain. We skirt perilous cliffs, and gaze in rapt admiration at some deep ravine, until our view is obliterated by an inopportune tunnel. Emerging, we zigzag down the mountainous descent to find ourselves once more in the lap of a plain as barren as the first. The barbarian character of the earth is appalling,—a sterile, blood-red soil, and siena colored rocks, interspersed with a few scraggly low bushes, or tiny clumps of stunted olive trees, warped and twisted as though in anguish at the cruel fate that set them there. Rarely do we see any signs of humanity, and then only in the form of strolling bands of Bedouins, or here and there a lonely herdsman watching over a herd of grazing camels. Upon a hilltop, silhouetted against the setting sun, a solitary horseman dismounts, and prostrates himself at his evening prayers. The fierce grinding of brakes, followed by a sudden, savage jerk of the train, warns us that our destination has been reached. Out we tumble, bag and baggage, to be assailed by hordes of dirty Arab porters, fighting to gain possession of our luggage. Breathlessly we escape from the melee by tumbling into a waiting hotel van,—an antiquated flivver with a rheumatic appearance and an asthmatic cough. No matter. Amid squeals of brakes and springs, the deafening clatter of loose windows and fenders, it plows its way through the crowded streets and stops before the door of our hotel. The less said about the hotel the better. I would not allow my bitterest enemy to spend a night there. Since, I have learned that there is a good hotel in Tlemcen; —it certainly is not the house I chose.

While we are still in Algeria, Tlemcen is distinctly unlike other Algerian towns. To be sure, some few European inhabitants have taken up their residence within its walls, but it is so far beyond the reach of a wide European civilization as to be almost wholly oriental in character. We spend some time exploring the city, peering into strange corners, wondering at the surging crowds of swathed natives, and visiting the mosques and the *medersas*. The mosques in and about Tlemcen are the last we are permitted to enter, for once the borders of Morocco are crossed, we must be satisfied with a hurried glance through the doorways. Let us enter the grand mosque. An attendant comes to the door at our bidding, slips a pair of enormous heelless slippers over our shoes and suffers us to enter. With difficulty and extreme good fortune we manage to keep them from slipping off to lose themselves on the matted floor of the interior. We find ourselves in a huge arcaded hall, supported by a forest of piers. The floors are covered with a woven matting, and the whitewashed walls are encrusted with delicate carving. Here and there a lamp of brass and colored glass sends a weird glow into some obscure corner, or over a squatting Mussulman, who prays or reads from the Koran, unaware of the picturesque appearance he presents with his shoes placed neatly beside him. The inevitable courtyard is a large rectangular affair, surrounded by horseshoe arches, and paved with tiles.



A STREET IN THE MEDINA, FEZ-EL-BALI
FROM A PENCIL SKETCH BY EUGENE F. KENNEDY, JR.



RUINED PALACE AND MINARET, SIDI-BOU-MEDINE
FROM A PENCIL SKETCH BY EUGENE F. KENNEDY, JR.

BAB MARSOUR EL ALEUJ, MEKNES
FROM A PENCIL SKETCH BY EUGENE F. KENNEDY, JR.

STREET SCENE, FEZ-DJEDID

FROM A PENCIL SKETCH BY EUGENE F. KENNEDY, JR.

Entrance to a Moorish Garden, Fez
From a Pencil Sketch by Eugene F. Kennedy, Jr.

From the center of the courtyard there rises a ceramic fountain, sending heavenward a thin jet of sparkling water, which falls noisily into a rectangular basin.

Without a doubt, the most interesting of the sights one sees at Tlemcen is the tiny village of Sidi-Bou-Medine, perched upon a hilltop, not more than a mile distant from the walls of the larger town below it. Nothing could be more oriental than this tiny village. It is entirely Mohammedan, and the vast ruins of an ancient palace and an exquisite minaret attest to its departed glory and importance. We leave Tlemcen with a sigh. We could easily have gone on exploring its charming mysteries, but the pleasant taste it has given us makes us the more eager to push onward to enjoy presently the far-famed beauty of Fez.

The train takes us as far west as Oudjda, where we are at last within the borders of Morocco,—and what a disappointment our first view of it is! The dust of the streets arises to choke us, and the incomparable filth and squalor of the native quarters send us back nauseated to the more habitable if less picturesque European section.

It is without regret, therefore, that we are awakened at 3 o'clock upon an icily cold morning to take the bus for Fez. Our tickets had been purchased the previous day, when the attendant who sold them assured us that there were none better at any price. Despite this, we find ourselves sandwiched in among a motley but picturesque gathering. The Arab who occupies the space to our right and on the outside is to be strongly suspected of naïve innocence of soap and water beyond the bare requirements of his religion, that requires him to wash his feet every Friday. On Thursday, however, it is difficult to associate the idea of cleanliness with the Mohammedan faith. The two live chickens he holds by their feet on his knees squawk in unison throughout the journey, and periodically flap their wings either in a futile attempt to escape or in complaint of their discomfort. On our left sits a huge negress, not only bulging beyond the limits of her clothing, but over her immediate companions as well. A pleasant soul she is,—every askance glance at her is rewarded by a broad grin, that stretches from one ear to the other, exposing a flawless set of snow-white teeth. What a ride! It is frightfully cold in this part of Africa until sun-up, and the cold wind nearly freezes us. The combined odor of man and fowl, from which there is no escape, spread as it is by the strong wind, is anything but pleasant. The overlapping portions of the female are nowise comfortable, while the undeniable presence of fleas, with no scratching

Entrance to the Ruined City of Chellah, Rabat
From a Pencil Sketch by Eugene F. Kennedy, Jr.

room, gives us much to think about during the seven hours we spend in traveling between Oudjda and Fez.

As far as Taza we drive over vast wastelands, the nearest approach to a real, honest-to-goodness desert we see. An occasional roving band of natives, and a French fort, garrisoned by coal-black Senegalese troops, are the only evidence we see of human habitation. Beyond Taza the prospect becomes more pleasing. Soon we reach the rings of hills that separate us from Fez. Climbing, descending, skirting a deep ravine in serpentine fashion, we are in constant fear that the least slip will send us tumbling down the steep inclines. Not so the driver; he carries on a nonchalant conversation, his eyes resting more often on the young woman by his side than upon the tortuous road before him! After reaching the height of the last range of hills, we round a corner to get our first glimpse of Fez. What a sight to behold! The sparkling white city, nestling in a cup of land, is spread like a map at our feet, many meters below us. The nearer hills are covered with the silver green of the olive trees and cactus. The more distant hills to the north have a barren, burnt air, while away to the south, the lofty Atlas mountains lift snow-clad summits which seem to extend to the sapphire heavens.

It is quite impossible to put the beauty of Fez into an expression of words. To use the superlatives really necessary to describe its exotic atmosphere would only create the suspicion that I am a real estate promoter! It is even less possible to capture its beauties with the aid of a pencil, for that medium portrays only a tiny, insignificant corner here and there, whereas every inch of the remarkable city is as fascinating as can be imagined. The subjects too, are a riotous mass of color, impossible to indicate in black and white. Our first glimpse of its busy street crowds, for the moment, all thoughts of architecture from our minds. Our attention is undividedly claimed by interest of the humanity that surrounds us. The first impression is one of extreme bewilderment; we know not which way to turn or what to do. In vain do we spend precious moments in consultation with Mr. Baedeker's maps. They tell us nothing,—we are engulfed within a maze where everyone but ourselves knows exactly where he is going. A little shamefacedly we accept the services of a guide, a handsome youth, arrayed in a long sapphire *burnoose* and coiffured by a red fez with a long black tassel. His services, until we form some idea of the orientation of this labyrinth, are most necessary, as one glance at the complicated twisted mass of *cul-de-sacs* shown on the map will prove. To begin with, Fez is divided

into three different and distinct sections. The largest portion, called "Fez-el-Bali" or "Old Fez," is separated by a distance of some 500 yards from "Fez-Djedid" or "New Fez," which was founded in the thirteenth century. The real new Fez or European city is situated about half a mile southeast of Fez-Djedid. Incidentally, this newest Fez, which in plan is the only part that seems to have any rhyme or reason, enters not at all into our present description.

Starting from the new port of Bou-Jeloud on the outskirts of Fez-el-Bali, the handsome youth of the sapphire *burnoose* conducts us to what appears to be the only main street of the city,—Rue du Tala. It is not more than 15 feet wide—if that—and resembles only a surging sea of colorful humanity illuminated by dazzling, animated spots of sunlight that creep through the crevices of the trellis covering above. We are carried by the surging crowds back to the days of Aladdin and his magic lamp. Unfolded before our eyes are all the tales of the Thousand and One Nights rolled into one. We pass from a patch of brilliant sunlight into the blinding obscurity of the shadows. We are pressed against leprous walls, which like the blind beggars who squat at them are largely innocent of windows, but are here and there pierced by some haughty portal of a mosque or *medersa* or the more humble windows of some dwelling. Now we come to a section of the street lined with tiny, cell-like shops, called *souks*, and here it seems the confusion is more intense than elsewhere. Our ears are humming with the mighty din of a thousand voices. Merchants sitting crosslegged amid their wares bargain lustily with a group of prospective buyers, each trying to outdo the other in vocal fervor, while porters loudly berate their lagging donkeys. Everyone seems occupied in yelling at the top of his lungs, and above all this din comes the shrill clanging of the water bearer's bell. Our nostrils are assailed by the odor of burning grease, intermingled with the aromatic odors of spices. The odor of man is no less predominant than the odor of animal; in fact, no one odor predominates. Each is as potent as the other, and together they form the odor of Fez. May a like odor never assail my long-suffering nostrils this side of its unique source!

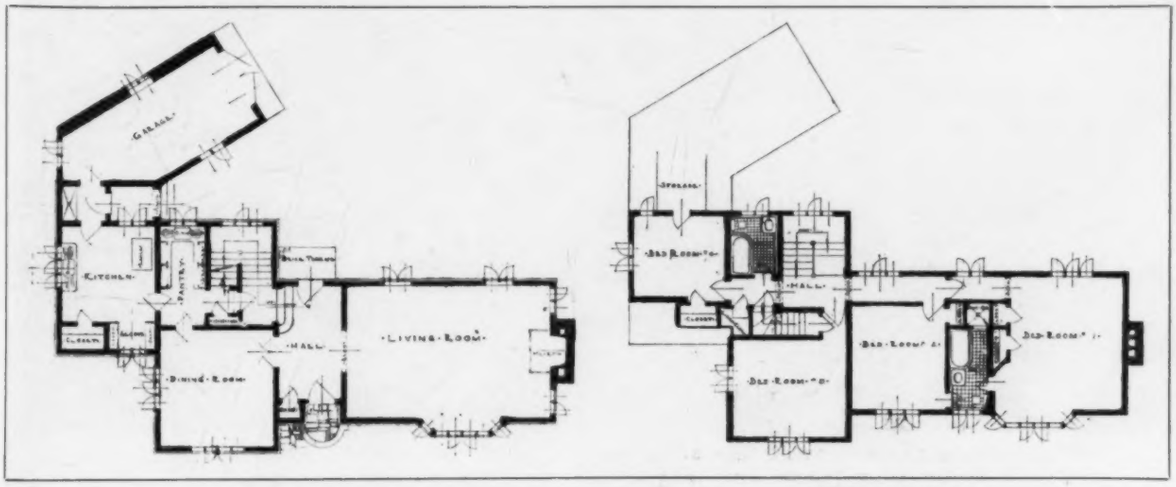
Now and again, some haughty cavalier, arrayed in his fine, immaculate *burnoose*, rides through the fevered crowd astride a richly caparisoned mule, his eyes flashing above a trim beard. Immediate passage is made at his stern cries of "Balek-Balek," but, as water fills the place occupied by a withdrawn object, so does the crowd surge in upon him as he goes by. Half-naked negroes, beggars in rags, jostle us. Indescribably filthy children, and veiled, white-clothed women, wend their way through the tide of restless humanity. Black men, brown men, men almost white; clean men, dirty men, pleasant odors, nauseating odors, mules, donkeys, dogs, strange sounds, shrill yells,—all these serve to make up the street life of Fez. A constantly varying mob, of no rhyme nor reason, scurrying here and there, afoot, or astride—as far astern as nature permits—of shaggy donkeys! As the day grows old, the steady roar of the street diminishes, and from the tops of the minarets comes the *muezzin's* call, repeated by the rabble below.

An excursion through this maze of twisted alleyways is a succession of surprises. We are greeted at the turn of this corner by a ceramic wall fountain, in the most fantastic and beautiful design. We issue forth from under an archway, to be confronted by a stately minaret of brick and tile, that rears itself from out the squalid buildings at its feet, while a bud-shaped dome beside it is strongly silhouetted against the azure sky. Here we come upon a magnificent portal of a mosque, or a *medersa*. If it be of the former, we must content ourselves with a hasty glance through it, but this happens to be that of a *medersa*, and our Christian feet are suffered to enter. Before doing this, it might be wise to mention that a *medersa* is a college to which the young men of the Empire come, to learn the Koran; in other words, it is a theological school of Morocco. Passing through a superb bronze doorway and up a few steps of faience and marble, we find ourselves in a tile-paved, rectangular court. The dado is composed of innumerable tiles of many colors, arranged in a most intricate diaper pattern, and capped—at about eye-height—by an Arabic inscription of black and white tile. Above this chiseled plaster walls recall to our minds a piece of ancient Brussels lace. Can this possibly be the work of man? Some time ago, we marveled at the delicacy of the plasterwork of the Alhambra in Spain, but that is coarse and heavy in comparison to these cobwebby walls of Morocco. The windows of the upper stories, admitting light and air to the cells of the students living there, are covered with lattices of spun wood, resembling thousands of spools joined together in criss-cross designs. Crowning all this, and enframing the cloudless blue of the heavens, is a heavy cedar cornice, supported on huge brackets and stalactites, delicately carved—as though in rivalry with the plasterwork below—and once covered with brilliant colors, long since departed with the weather of yesteryears. Our gaze descends to rest upon the placid waters of the rectangular pool in which all this minute beauty is reflected. This is a description of all the *medersas* in Fez, yet it is a description of no one in particular. They are all varied, one from another, in a wide array of designs and *motifs*, wherein lies much of their charm.

Photos. John Wallace Gillies

HOUSE OF FRANK HARWOOD, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT

ON a rocky and wooded hillside in one of the popular residential districts of Westchester County, among the many attractive houses recently designed and built by Lewis Bowman, architect, the house of Frank Harwood, Esq., has many interesting and artistic features. A combination of wood veneer and stucco on wire lath and wood frame, there is an undeniable charm about this simple, straightforward English design. The metal casement windows are well proportioned and properly spaced, giving wide wall surfaces to catch the filtered shadows of the foliage surrounding the house. The



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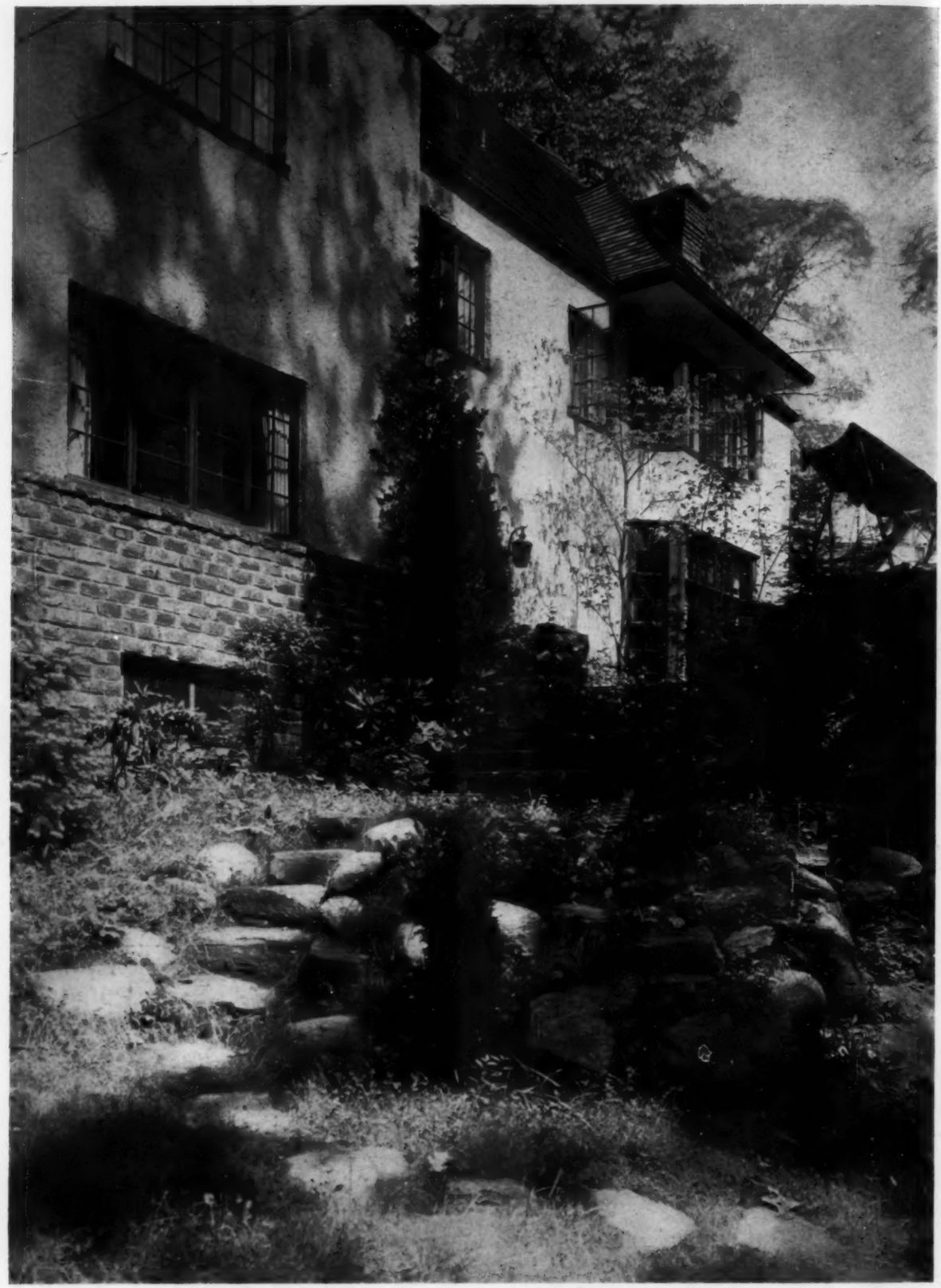
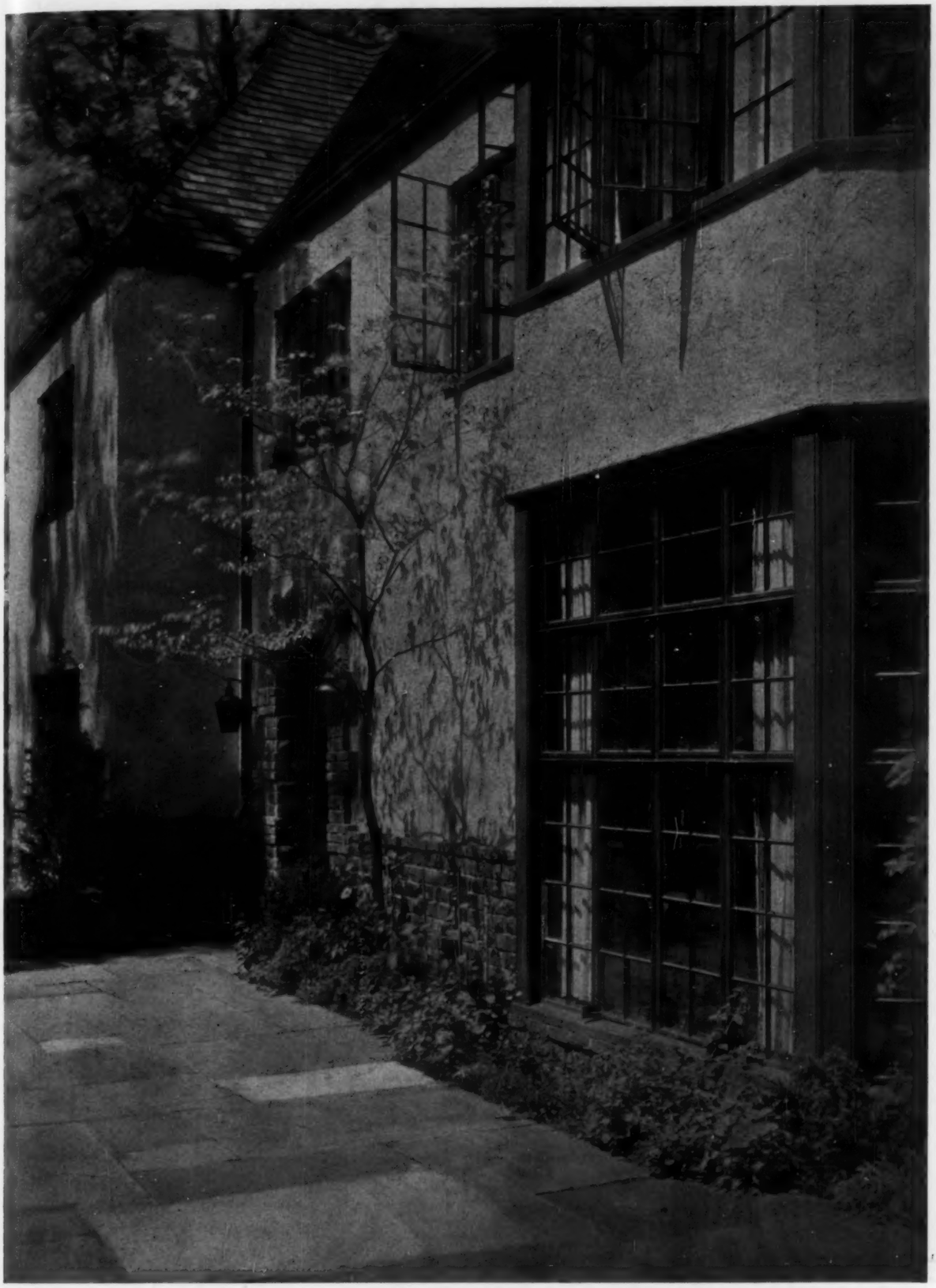


STEPS LEADING FROM THE ROCK GARDEN UP TO THE ENTRANCE TERRACE
HOUSE OF FRANK HARWOOD, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT



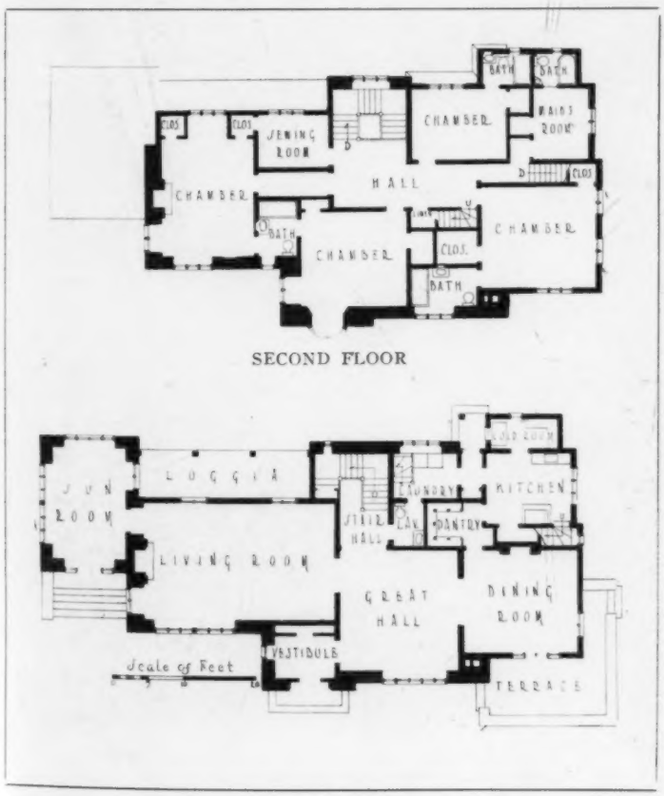
ENTRANCE TERRACE
HOUSE OF FRANK HARWOOD, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT

LIVING ROOM
HOUSE OF FRANK HARWOOD, ESQ., BRONXVILLE, N. Y.
LEWIS BOWMAN, ARCHITECT

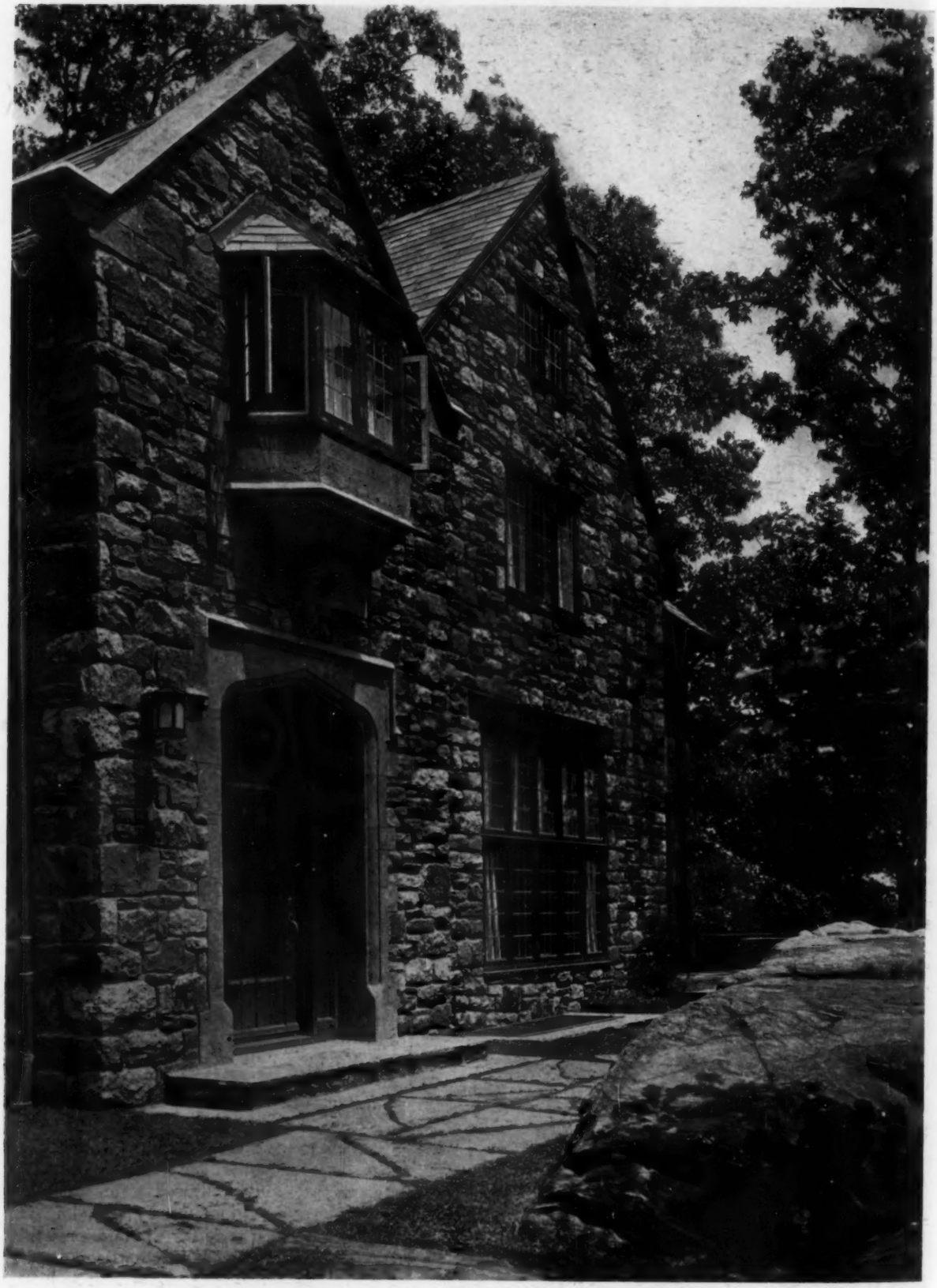
ENTRANCE DOOR

roof has a height and a pitch sufficiently steep to add character to the design and to permit comfortable rooms on the third floor. The dormers which light and ventilate these rooms do not appear on the front elevation. Rich greens and dull browns and reds are the color stains of the shingles used to produce a marked contrast between the high roof and the severely plain stucco walls. The texture of the stucco itself is exactly right, being neither too rough nor too smooth. In the illustrations the excellent texture of the stucco can be studied and appreciated. In its total lack of ornamental detail, such as door and window trim and cornices, this house suggests the best type of modern English domestic architecture. It might well have been designed by such a master as Sir Edwin Lutyens. The shallow bay window with its overhanging roof pleasingly breaks the long sweep of the front facade. The projection of this bay is repeated with greater emphasis in the dining room wing, which makes a strong terminal feature at one end of this facade. The flagstone entrance terrace is successfully separated from the wilderness of outcropping ledges and underbrush by a low fieldstone wall. Rough stone steps lead from this terrace to a rock garden, appropriately located in the midst of the woods. Regarding the equipment of this house, the architect reports that an oil-burning hot water system was used for heating. Paint instead of wallpapers was used on the interior walls for decorative purposes. The design of this house could hardly have been more successful.

HOUSE OF DR. ARTHUR H. MERRITT, FIELDSTON, N. Y.
W. STANWOOD PHILLIPS, ARCHITECT



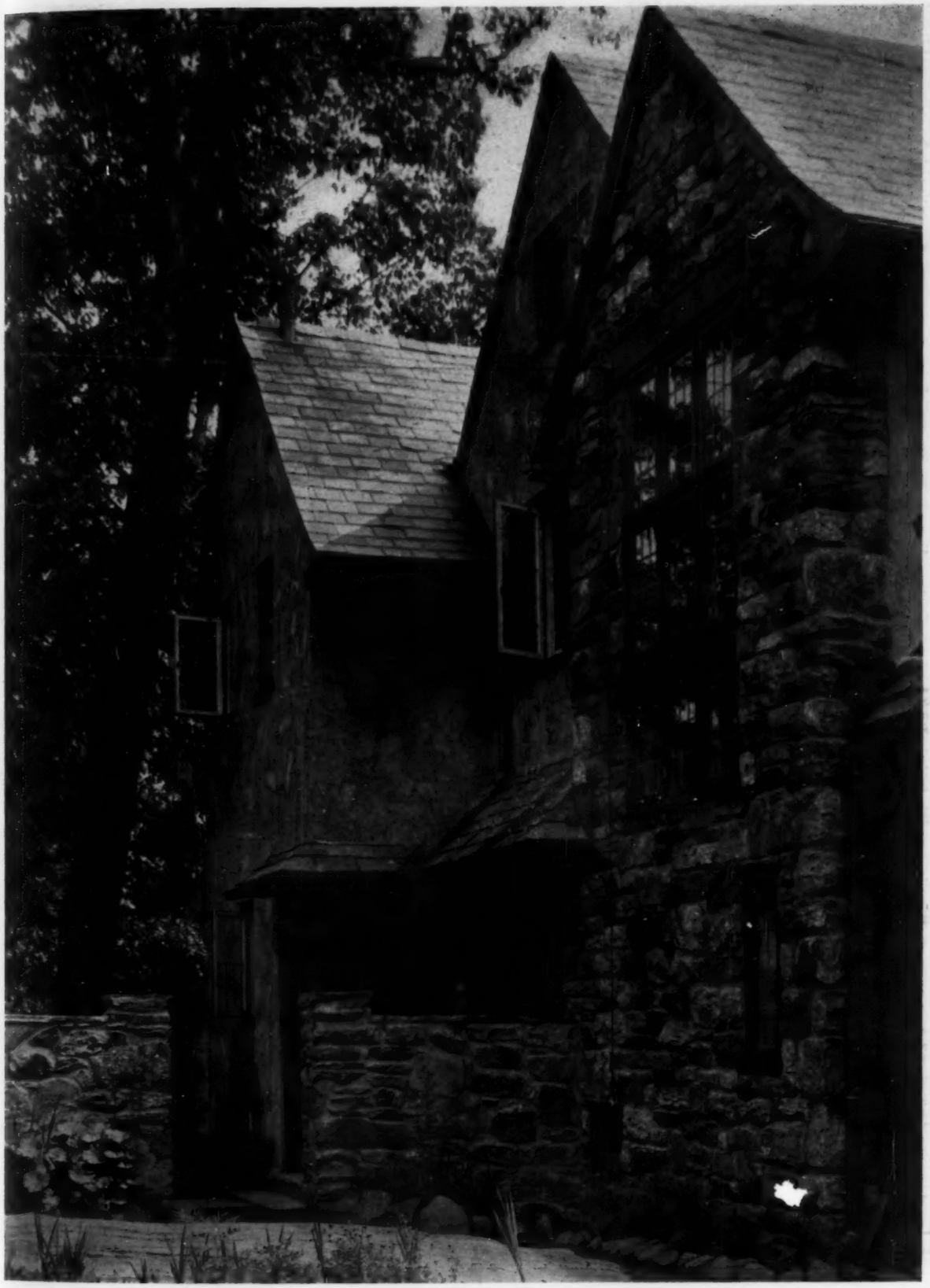
THIS typical English stone house was designed with the idea that when finished it should appear to belong on its site, and that it should give the impression of having been designed for the picturesque location where it stands. To achieve this purpose, the Cotswold type of English manor house was chosen as being particularly appropriate for use in a rugged and well wooded type of country. The materials used were rough fieldstone, laid up to a fairly flat surface, and rough-finished stucco. The stone used was taken from the site and broken up so as to lay to fairly horizontal joints. There is undoubtedly more variety of color and greater textural charm in this type of stonework than is found in the carefully laid, smooth-finished stonework of the Cotswold cottages. In regard to the construction of this unusually picturesque and artistic house, the architect says that rough-textured slate was used for the roof, white wood detailed in the early Georgian style for the interior finish, oak in antique finish for the floors, and a vapor system for the heating. The house was completed in July, 1921 at the cost of approximately 65 cents per cubic foot.



MAIN ENTRANCE

HOUSE OF DR. ARTHUR H. MERRITT, FIELDSTON, N. Y.

W. STANWOOD PHILLIPS, ARCHITECT



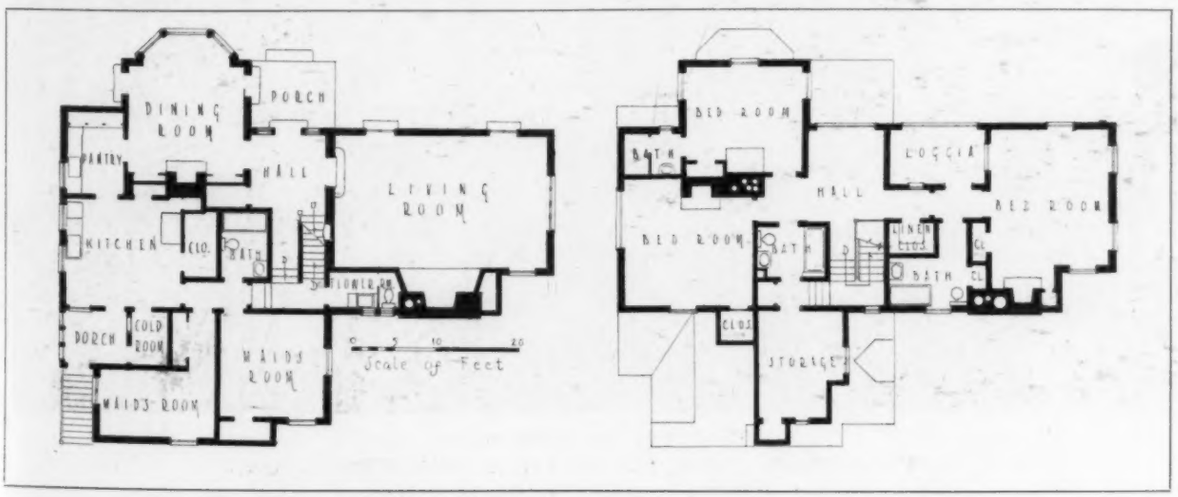
GARDEN ENTRANCE
HOUSE OF DR. ARTHUR H. MERRITT, FIELDSTON, N. Y.
W. STANWOOD PHILLIPS, ARCHITECT

WILD GARDEN ADJOINING HOUSE
HOUSE OF DR. ARTHUR H. MERRITT, FIELDSTON, N. Y.
W. STANWOOD PHILLIPS, ARCHITECT

Photos. Frances Benjamin Johnston

HOUSE OF MRS. JAMES M. TOWNSEND, GREENWICH, CONN.
EDWARD CLARENCE DEAN, ARCHITECT

ON a rocky knoll near the end of Mead's Point, looking out over Long Island Sound through trees a century old, stands this simple and homelike English house. The many casement windows, the tiny covered porch, the hospitable looking brick-based bay window and the recessed loggia on the second floor are the salient features which give charm and individuality. The general construction was stucco on wood lathing above stone and brick foundations. The roof is covered with black slate, metal casements were used, the floors are oak and composition, and heating is by hot water. Completed in April, 1926, the cost of the house was approximately 75 cents per cubic foot, or about $32,000.



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SERVICE ENTRANCE AND GARAGE

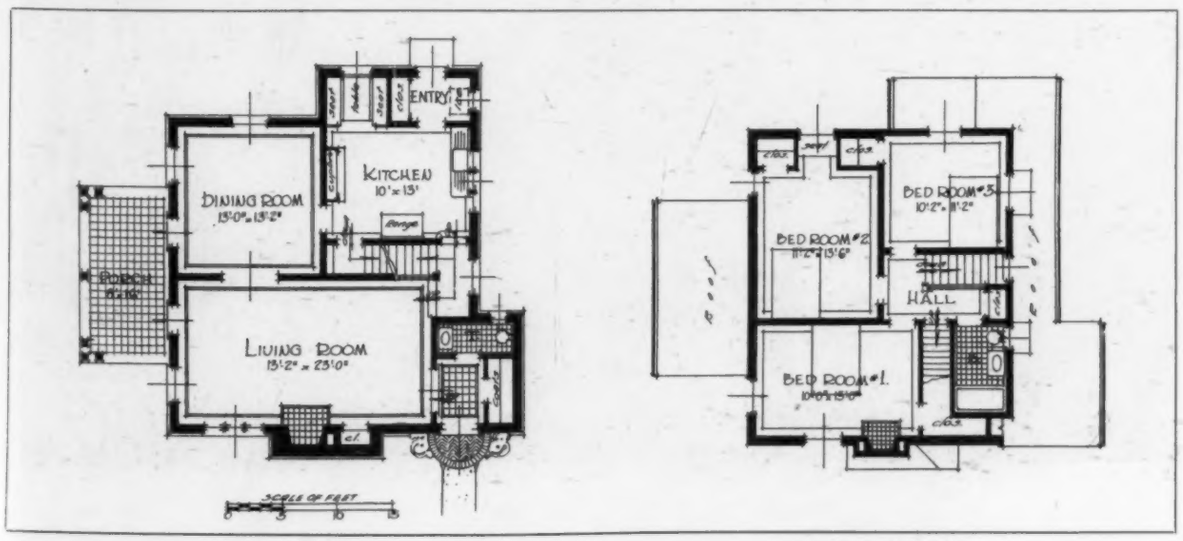
FIREPLACE IN LIVING ROOM

HOUSE OF MRS. JAMES M. TOWNSEND, GREENWICH, CONN.

EDWARD CLARENCE DEAN, ARCHITECT

HOUSE IN STUCCO AND HALF TIMBER, BAYSIDE, N. Y.
R. C. HUNTER & BRO., ARCHITECTS

HERE is another interesting example of an unusually picturesque house in the English style. Characteristic of English and French farmhouses, the windows are small and few. One of the successful and artistic features of the design is the closed-in living porch, the roof of which is a continuation of the steep pitched roof of the house itself. Constructed of hollow tile covered with stucco, with wood shingles used for the roof and wood casements for the windows, chestnut for the interior millwork and rough plaster for the interior wall finish, it was possible to build this house at a cost of 50 cents per cubic foot, or about $13,900 in 1927. The cubic contents are 27,800 feet.



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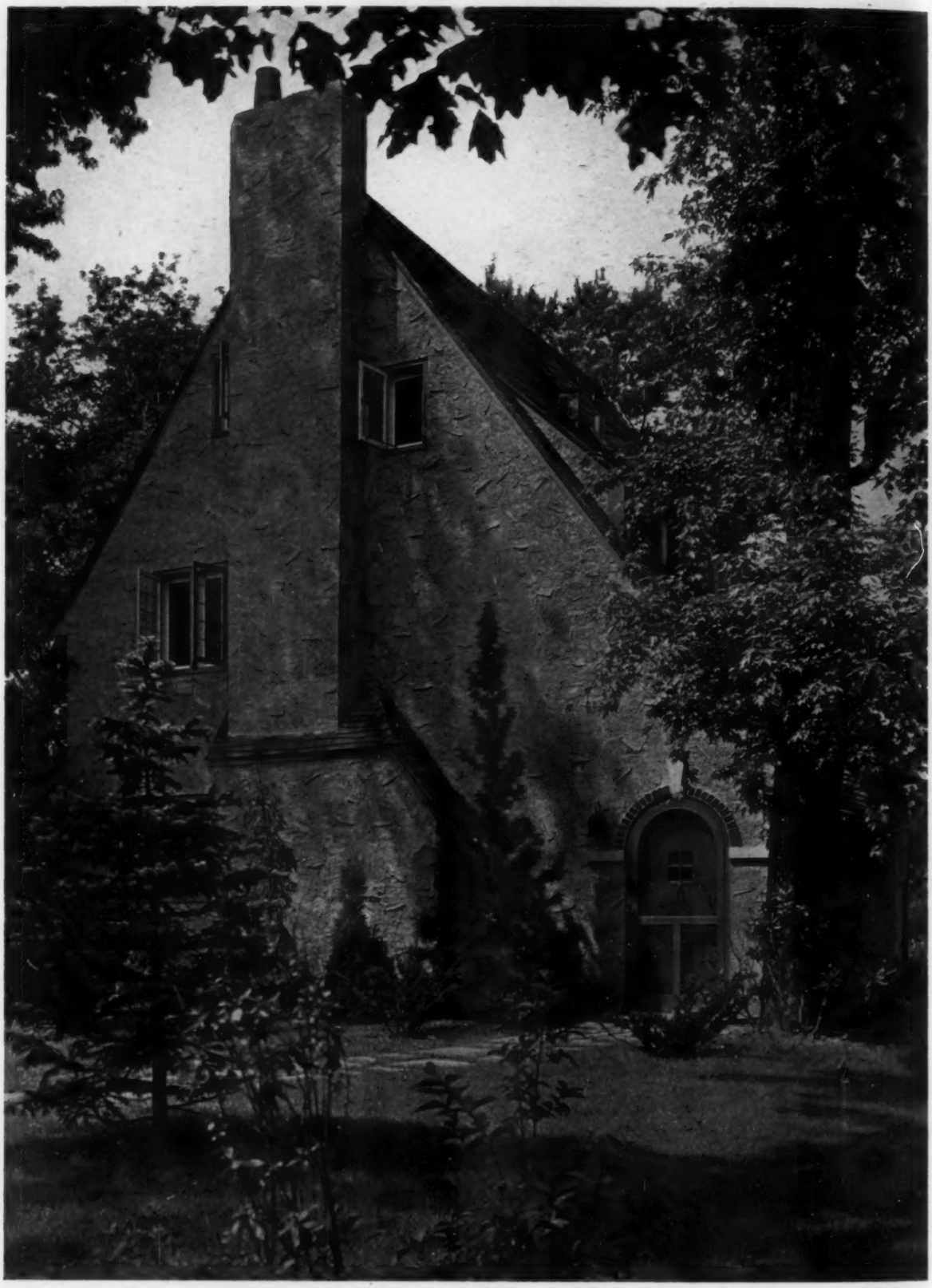


SOUTH END AND ENTRANCE DOOR

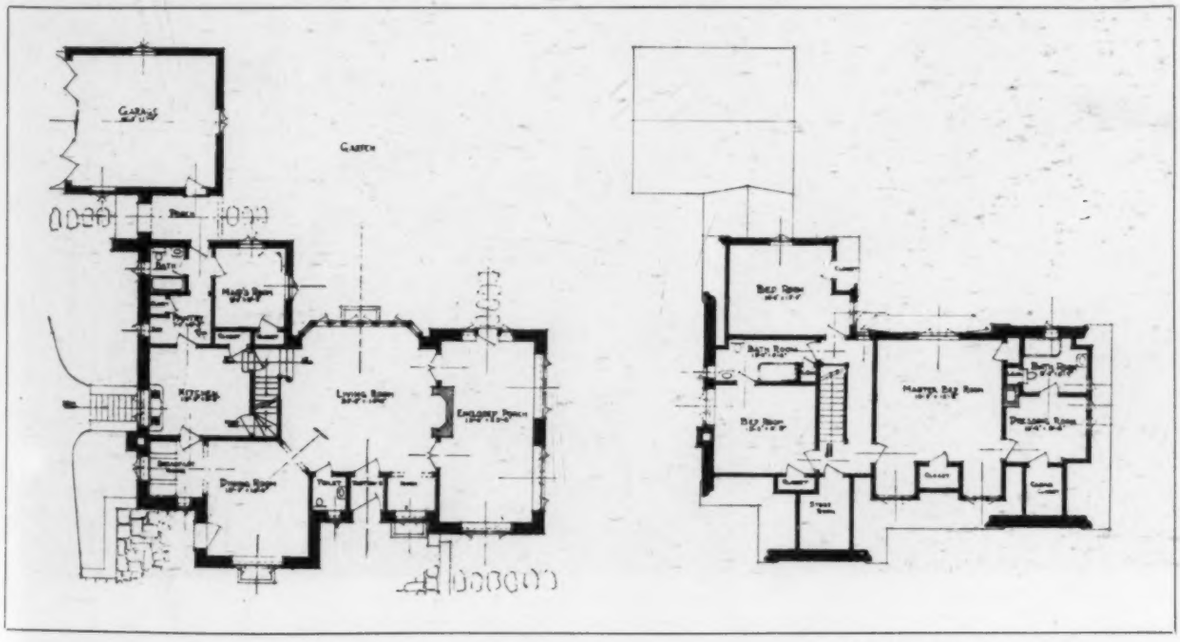
STUCCO HOUSE IN THE FRENCH STYLE, BAYSIDE, N. Y.

R. C. HUNTER & BRO., ARCHITECTS

Photos. George H. Van Anda

HOUSE OF W. H. DEWAR, ESQ., JENKINTOWN, PA.
HENRY L. REINHOLD JR., ARCHITECT

THE many gables of this low and homelike stone house suggest the Cotswold cottages, but the character of the stonework and the large casement and dormer windows are more American in appearance than English. The house and garage, which are connected by a small loggia or porch, are well grouped as regards both the utility of the plan and the beauty of the general proportions of the whole group. It is well designed in relation to its surroundings, and seems to spring naturally from the meadow in which it stands, this effect being secured partly by the use of an informal rock garden surrounding the house. For the most part, the exterior walls are of local quarry stone, with green, purple and brown slate roof. The interior trim is of yellow poplar, with special English oak trim in the living room. The building was completed in 1927 at a cost of $24,971, or about 45 cents per cubic foot.



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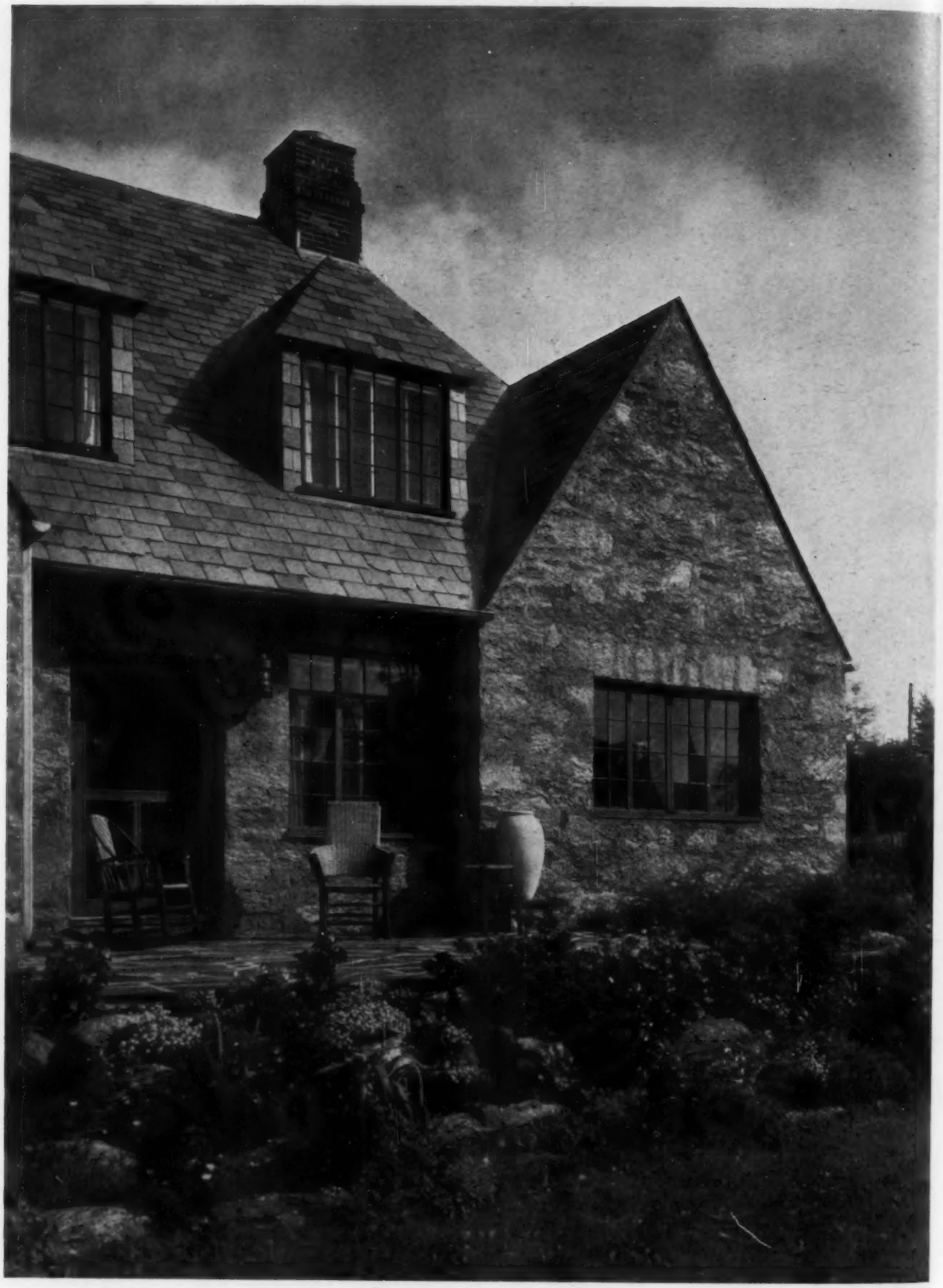
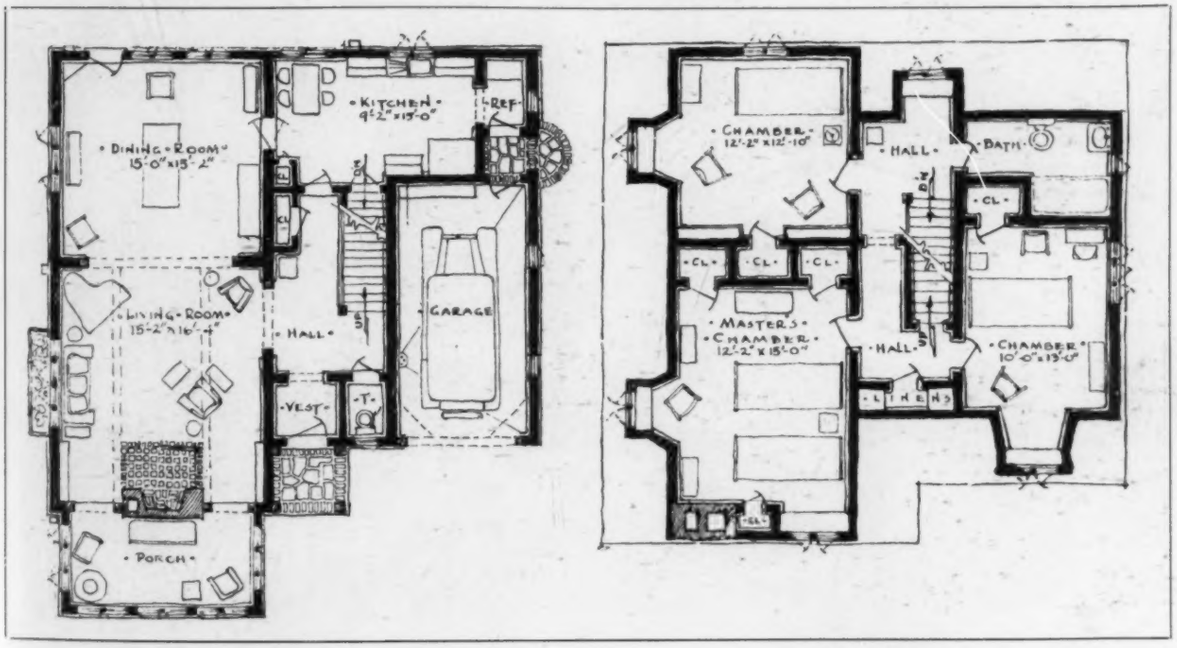


ENTRANCE TERRACE
HOUSE OF W. H. DEWAR, ESQ., JENKINTOWN, PA.
HENRY L. REINHOLD, JR., ARCHITECT

Photos. George H. Van Anda

HOUSE OF ANTON WALDEIER, ESQ., BELLEROSE, N. Y.
ANTHONY J. C. WALDEIER, ARCHITECT



FIRST FLOOR SECOND FLOOR

THE first thing that will strike one on examination of this illustration is the unusual treatment of the chimney, where the bricks of varying sizes are laid in haphazard fashion. The effect produced is rather bizarre. The details of the rest of the house are fairly conservative and in keeping with good English precedent. Although the dormers are pleasantly generous in size, the windows in them are sufficiently small to give the proper English note. In designing small houses in the English style, American architects should remember that in the English prototypes the windows are usually small. In a climate blessed with sunshine only a few days out of the year, small windows are practical, since the smaller they are the more cold and dampness they keep out. One of the advantages of using the English country house style for American small houses is that it is convenient and appropriate to use casement windows, which provide the maximum of fresh air when opened, as well as maximum light.

ENTRANCE TERRACE
HOUSE OF ANTON WALDEIER, ESQ., BELLEROSE, N. Y.
ANTHONY J. C. WALDEIER, ARCHITECT

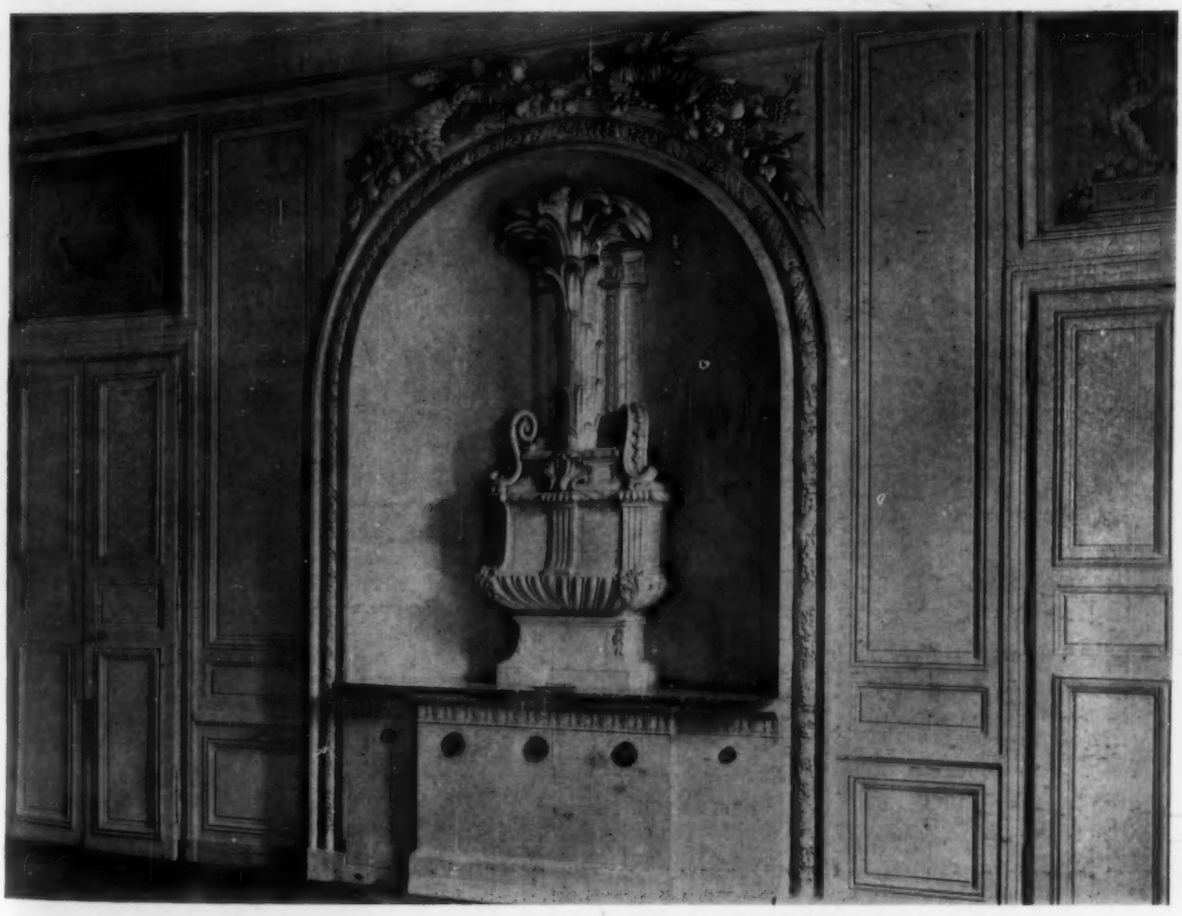
INTERIOR ARCHITECTURE

HOTEL GOUFFIER DE THOIX, PARIS

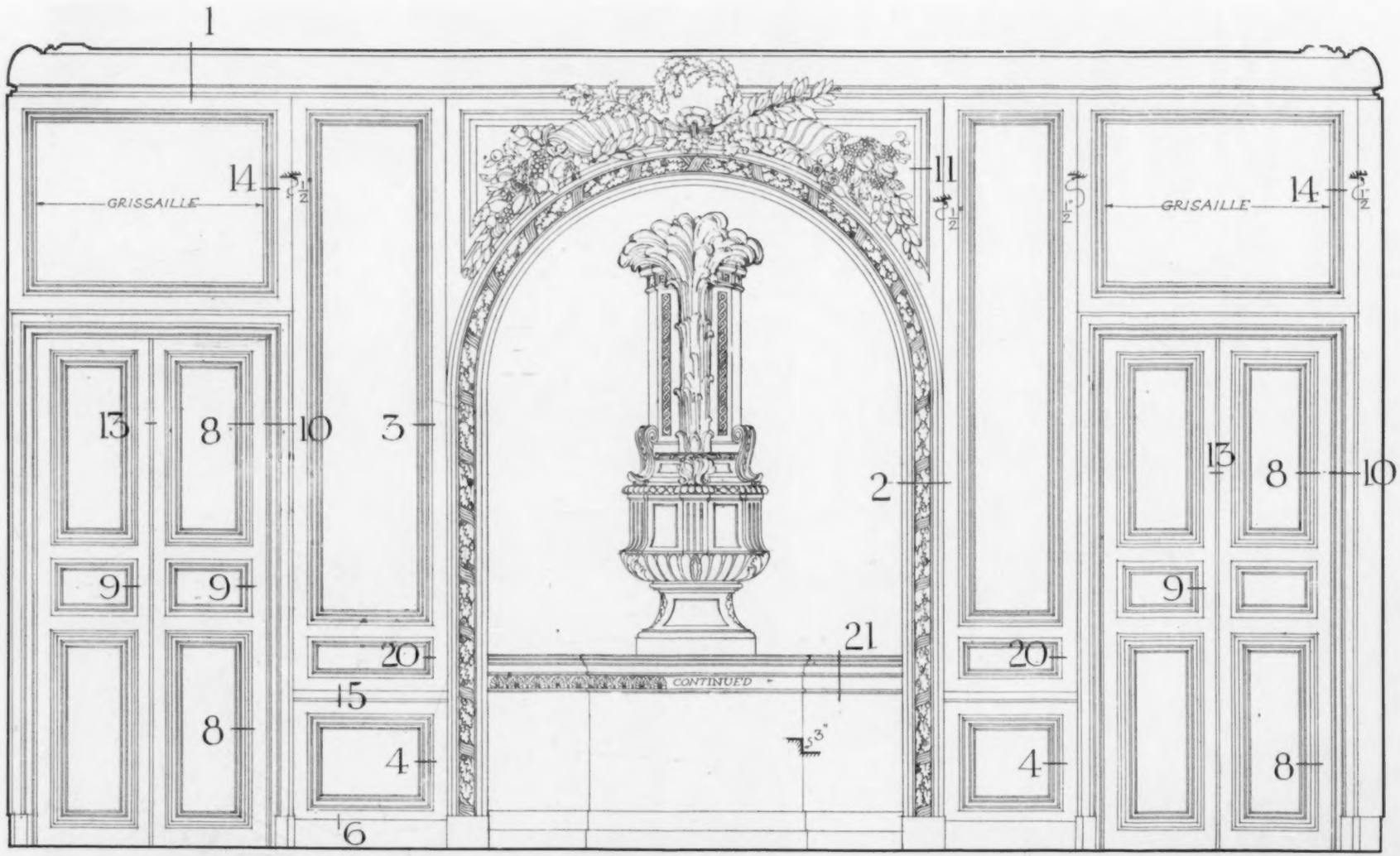
TEXT AND MEASURED DRAWINGS BY C. HAMILTON PRESTON

HOTEL GOUFFIER DE THOIX, 56 Rue de Varenne, was built about 1746 by Gouffier, Marquis de Thoix, a man of great fortune, which he had inherited and to which he added greatly by a very advantageous marriage. Like so many of the hotels in the grand manner of the Faubourg St. Germain, the Hotel Gouffier de Thoix is very imposing, grandly planned, and distinguished in design. Although the interiors throughout are most sumptuous, the subject of our sketch stands out from all the others by its almost severe plainness and the boldness of its conception. One can with difficulty judge from the illustration the scale of the room, with its niches; hence the value of scale drawings and details.

The paneling, mouldings and cornice are simple and vigorous, and the design symmetrical and balanced. Over the doors occur simple designs in *grisaille,* and nowhere in the room, except in the niches, is there any attempt at decoration. But the niches are remarkable for their size, boldness and vigor. The large architrave mould is richly ornamented in its middle member with an oak leaf *motif,* while over the arch is a most extraordinary decoration, a composition of cornucopias, wreaths and sprays of laurel and oak leaves. The whole design is tremendous in scale and assertive to the last degree. In one of the niches is placed a very decorative porcelain stove, beautiful in design, while in the other is a huge fountain vase of rare design and ornamentation. Both these niches are painted unusual pastel shades of light red, yellow, green and blue, while the walls of the room are gray. The marble floor in black and white with an octagon and square design, is very elegant. Another feature is the built-in portions of the niches with marble tops which serve as a base in either case for the stove and the fountain vase. There is probably no Louis XVI interior in all France so commanding in scale and so vigorous. At the same time it is restrained, and creates an impression of quiet taste and dignity.



Niche Containing Decorative Porcelain Stove; Room in Hotel Gouffier de Thoix, Paris

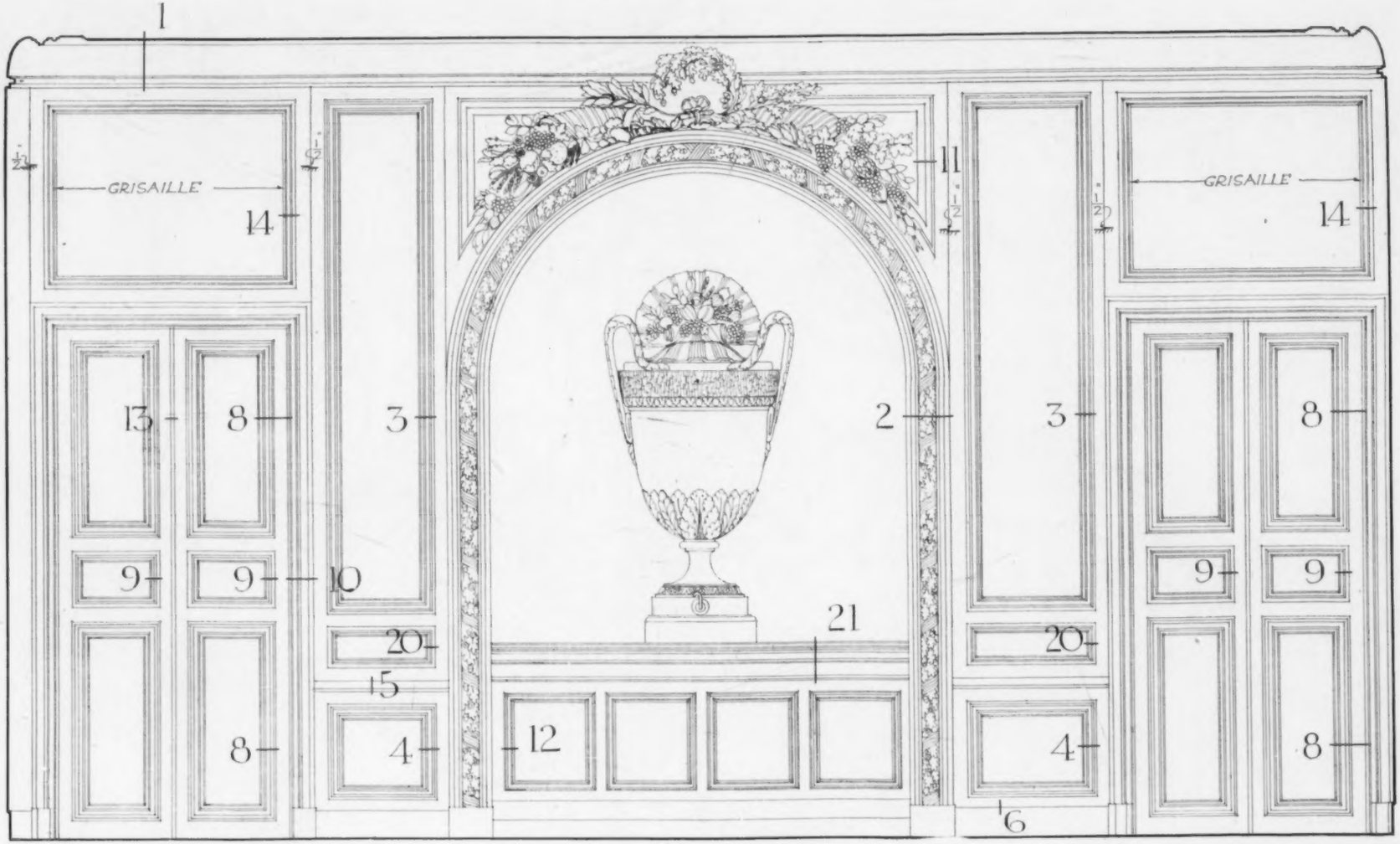


ELEVATION C~C

HOTEL GOUFFILR DE THOIX

PARIS

Scale $\frac{3}{8}$" = 1 Foot

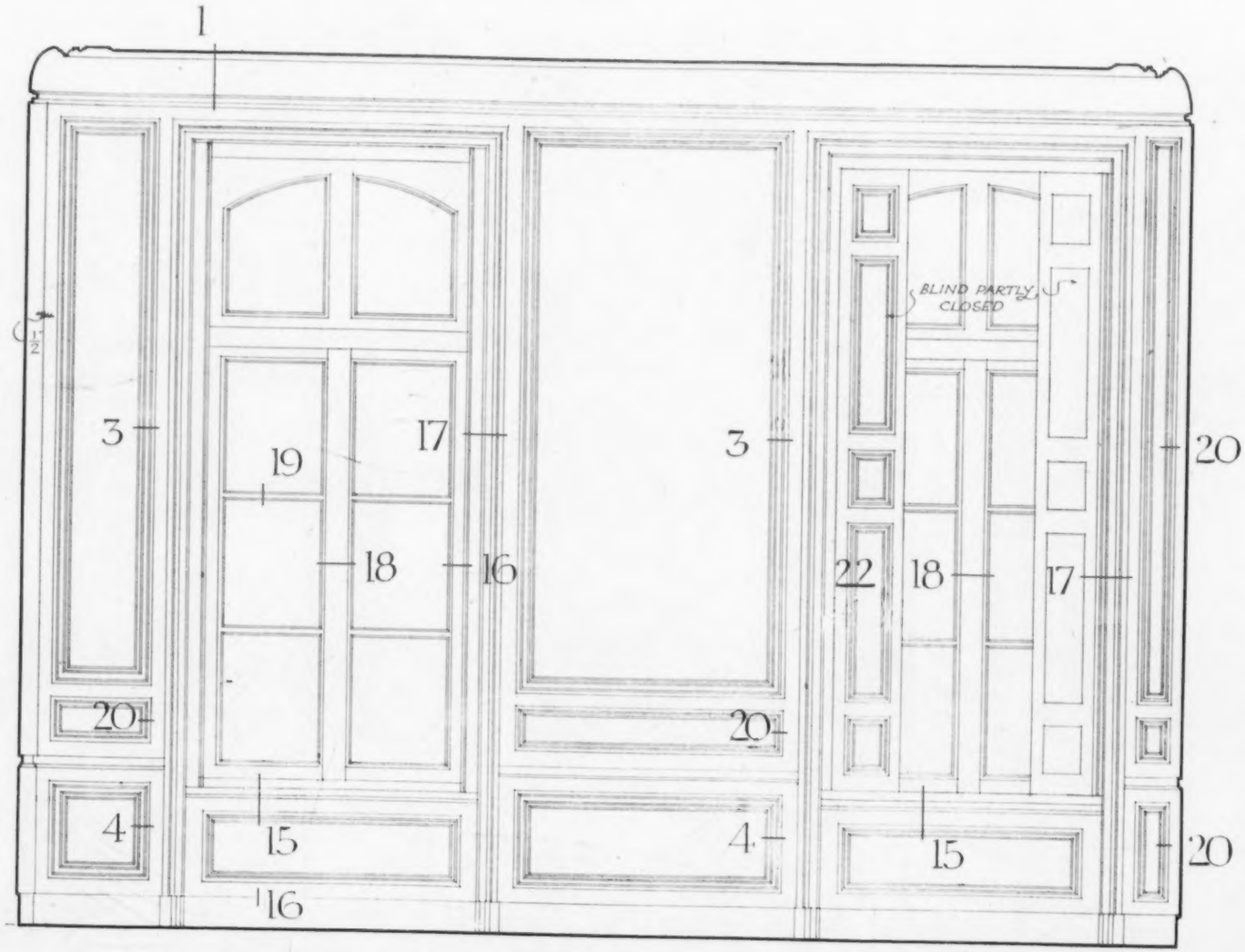


ELEVATION A~A.

HOTEL GOUFFIER DE THOIX

PARIS

Scale $\frac{3}{8}$" = 1 Foot

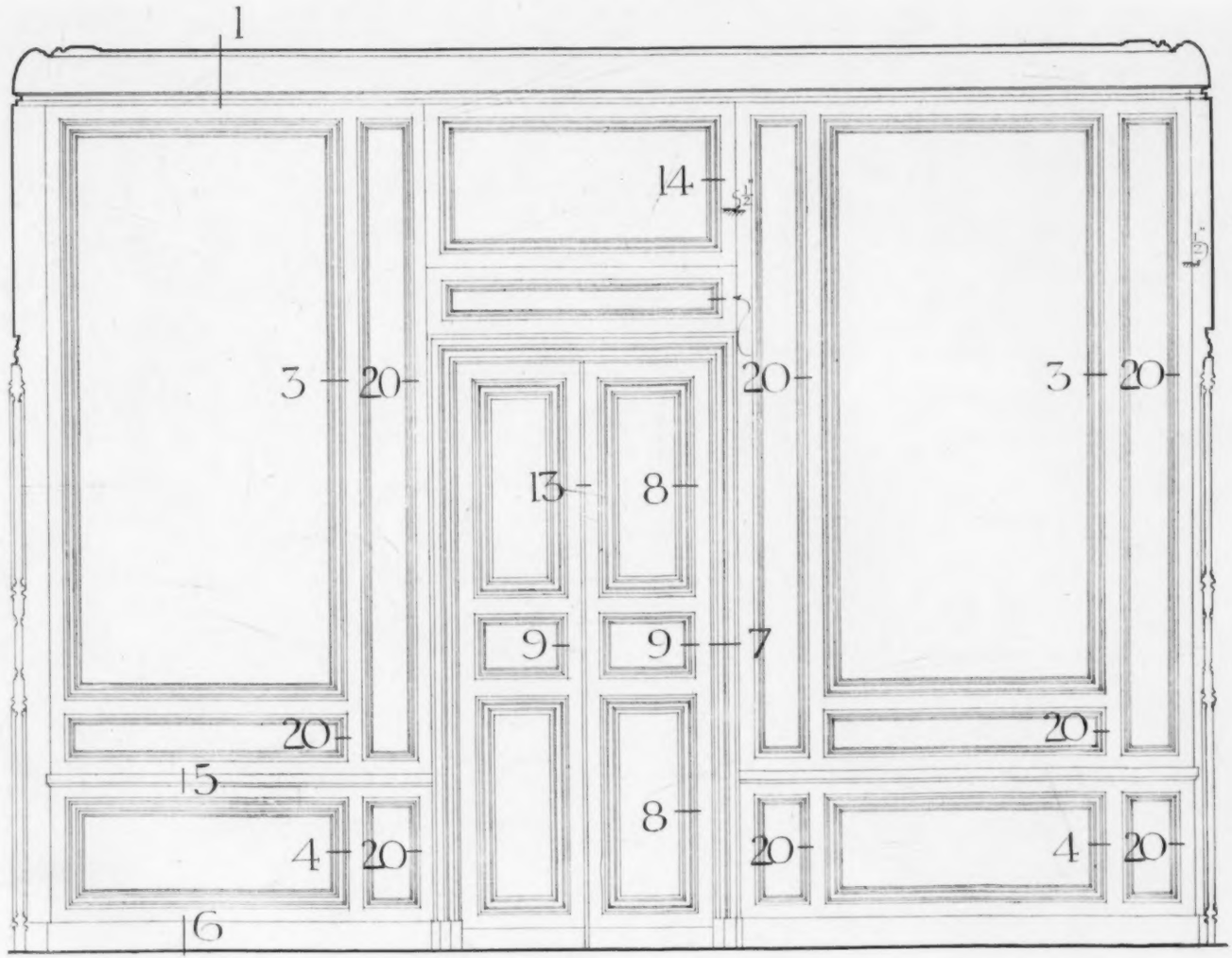


ELEVATION D~D

HOTEL GOUFFIER DE THOIX

PARIS

Scale $\frac{3}{8}$" = 1 Foot

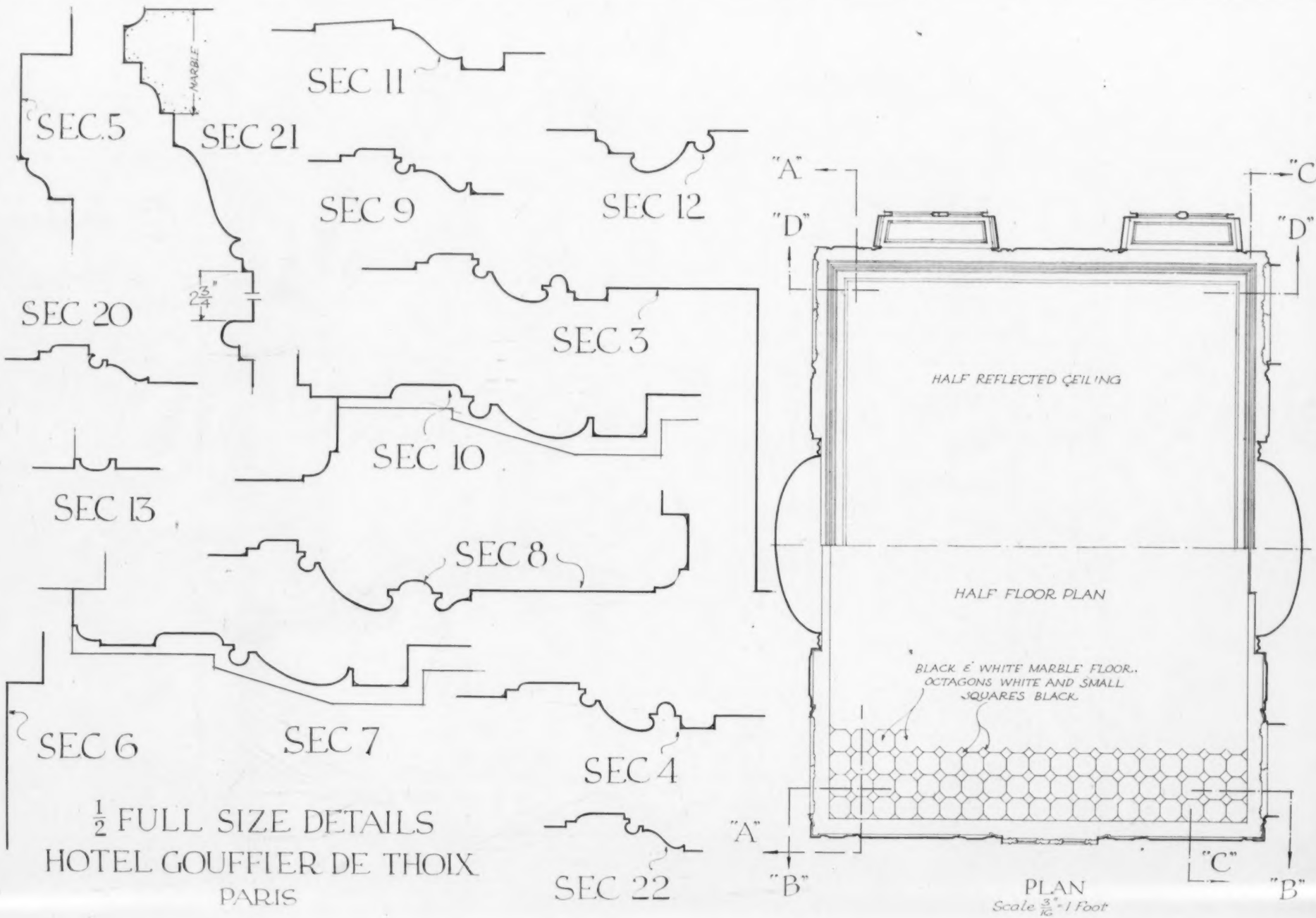


ELEVATION B~B

HOTEL GOUFFIER DE THOIX

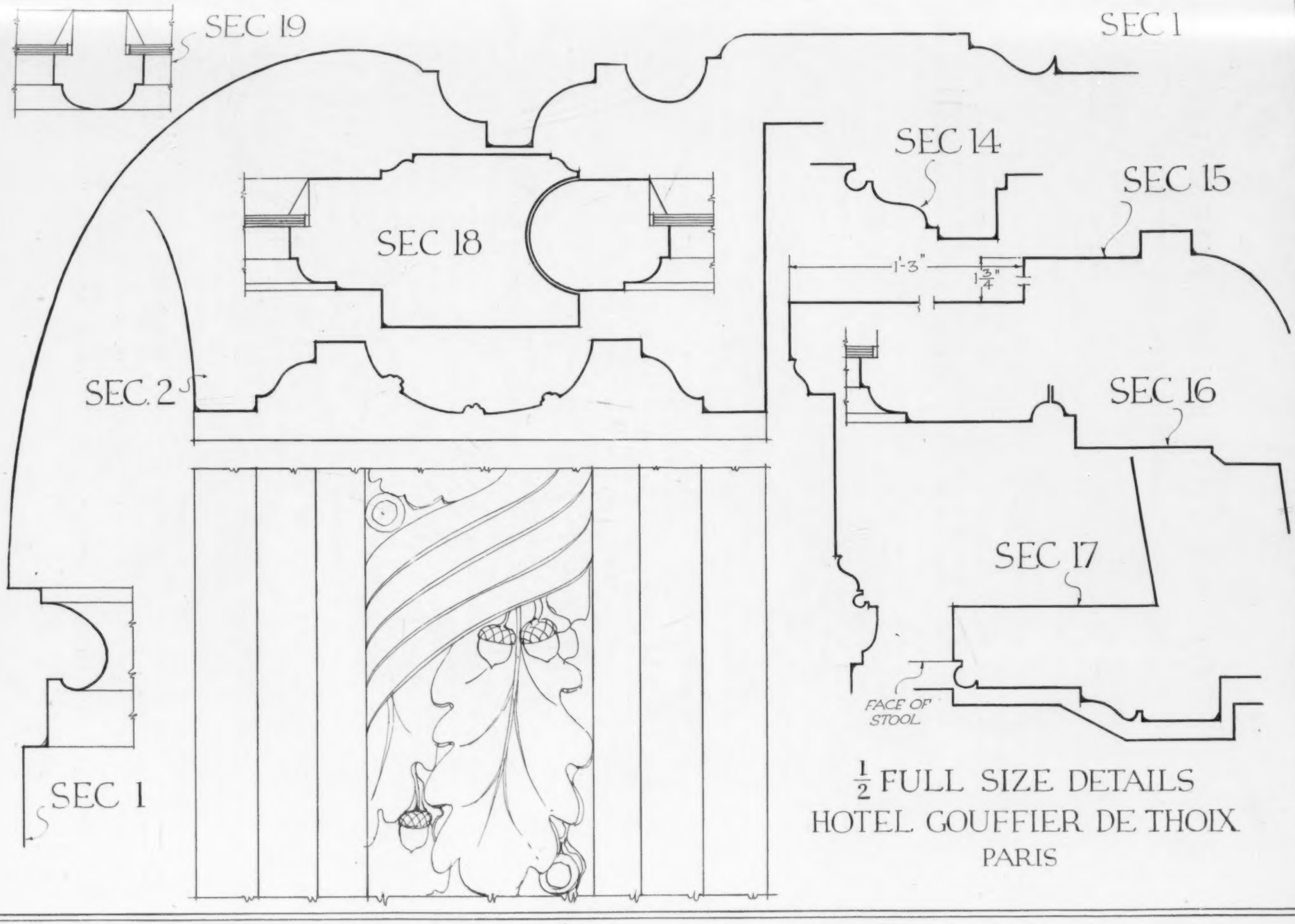
PARIS

Scale $\frac{3}{8}$" - 1 Foot



½ FULL SIZE DETAILS
HOTEL GOUFFIER DE THOIX
PARIS

PLAN
Scale 3/16" = 1 Foot



½ FULL SIZE DETAILS
HOTEL GOUFFIER DE THOIX
PARIS

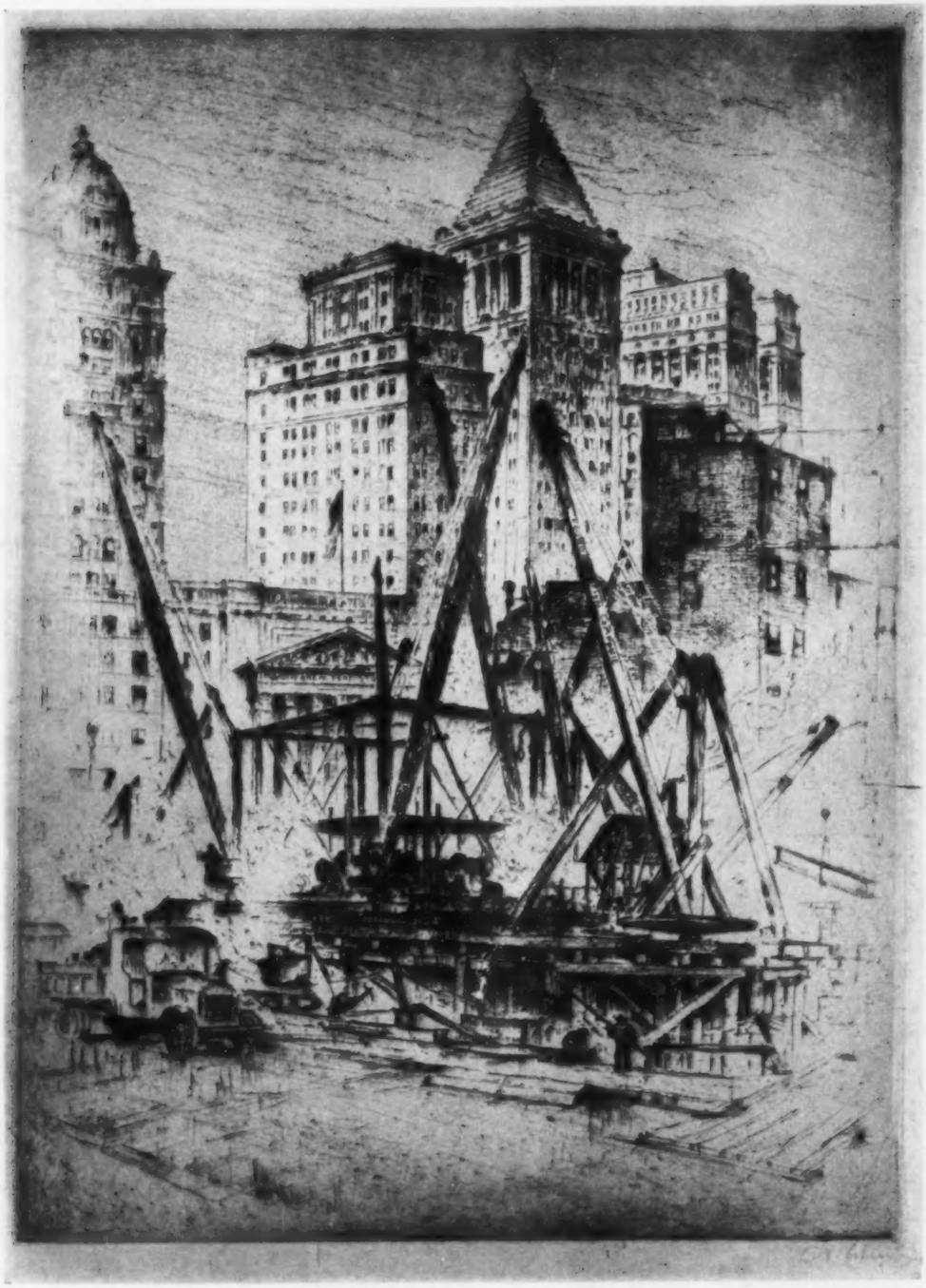
THE ARCHITECTS' FORUM

A PLEA FOR CONSTRUCTIVE MODERNISM

WE still have with us many horrors of our past, —that epidemic of Victorian Gothic and Queen Anne, done both in imitation stone and in wood; Mansard attempts; then heavy, brutal Romanesque; cast iron monstrosities, etc. Now comes the question: Are we entering upon another period that will be looked at askance 20 years from now? Always we of the present think we are different from those of the past. It is like "The king can do no wrong." It is always the past generation that made the mistakes. Therefore, no one is popular who questions the motives of the present. Men are now coming forward willing to throw away all of the good accomplished since early colonial days, each believing himself above making the mistakes of the past, and able to accomplish stylistic originality without considering precedent. I do not believe that we have to copy religiously the Classical or Renaissance styles, but I do claim that we cannot, as some modernists are trying to do, throw away all teachings of the past. Although we should not be mere copyists, we can still consider the past, even if we are at the threshold of the development of a distinctly American architecture, an event which we all desire to happen if possible in our own lifetimes. At the same time, we do not want to look back years from now and consider the work of the 1930 era as just another attempt, such as was the *Art Nouveau* of France of 1900. They thought, as we do today, that they were progressing. Now even they can look back and must admit that they did not create a lasting style.

We have begun to study the commercial and domestic phases of our problems, and have in many cases developed a style practical and expressive for our factories and warehouses, for our large office structures, and for our newer public buildings. In these buildings to which I refer all precedent has not been thrown away but adapted to modern conditions. It is true that in the past the Romanesque style was used in types of structures for which it was fitted, especially before the age of steel construction, when the combination of massive walls and details provided dark interiors. The same objections apply to buildings screened by deep classical colonnades with slit-like windows between the columns, which create deep shaded reveals and make impossible working space within. This does not mean, however, that we are not to use these styles. Any problem must be analyzed and studied to obtain satisfactory results. As an example to illustrate the point, take Richardson's Pittsburgh City Hall, considered a great example of modern architecture when it was built, and then the new New York Academy of Medicine by York & Sawyer. This latter is not just a stylistic crib but a building designed with understanding and feeling for both its function and appearance. The motifs of both were derived from the same source, yet the newer example is both practical and attractive, while the older is not.

We have other notable examples of a modern handling of architectural design that are original in conception and yet not freakish through the use of cubist methods. It does not seem necessary to go through in architecture what Europe, and even we, experienced for a time in painting and sculpture. Our architecture has progressed further than any of our other arts, and it is conceded by foreign critics to lead the world today. We all want to feel that we will continue to lead, and in some recent work our architects have shown an able handling of new problems. We are, however, greatly indebted to the past, and that does not mean only as copyists. It would be ridiculous to agree with certain radicals who have unfortunately carried out large commissions recently, that McKim or White did not add to our artistic wealth and progress. When one criticizes, one must consider the work of the greatest and most noted of our architects and what they designed and accomplished through a free and intelligent adaptation of precedent. The *Chicago Tribune* building is modern and new, an able handling of the problem, yet based on precedent, while some of the buildings of nearly the same size in the New York midtown section are equally modern and new as to mass and color but are failures as far as exemplifying the principles of good design. There seem to be two classes of modernists who have in common only one trait,—their anxiety to get on the band wagon. The able, thinking men are striving to express modern ideas in a manner that will live, while those of the radical element are thinking only of cleverness in arranging mass, form and materials, forgetting everything else in their struggle for effect. This is the group which feels that the past is endeavoring to shackle the present. Instead, it is only showing and paving the way for greater achievement and progress. It has been a gradual upbuilding through centuries, first in one country and then in another, keeping alight and carrying on the lamp of architecture, until it now seems as though we have reached the greatest opportunity of all time. According to some, we ought to go back to the kindergarten and start over, instead of continuing our education. But I for one hope that we are on the road to discovering a distinctive American architecture, that our approach will be gentlemanly, and that American genius will evolve a style of scholarly and lasting merit instead of one based on transient and transparent cleverness. *Dwight James Baum*



FOUNDATIONS, EQUITABLE TRUST CO. BUILDING, NEW YORK

TROWBRIDGE & LIVINGSTON, ARCHITECTS

From the Etching by Anton Schutz

UNIV. OF MICH.

THE
ARCHITECTURAL
FORUM

VOLUME XLVIII NUMBER FOUR

APRIL 1928

PUBLIC BUILDINGS AND THE ARCHITECT

BY
SULLIVAN W. JONES
FORMER ARCHITECT OF THE STATE OF NEW YORK

THE part architecture should play and the place of the architect in public building progress are questions assuming aspects of vital interest to the architectural profession. At the sixtieth convention of the American Institute of Architects in Washington last May, while discussing these questions, I pointed out that during the next 12 years a minimum of one and one-half billion dollars would have to be spent on institutional and other public buildings by the 48 states collectively. More recent studies of the building needs, which have accumulated and are now accumulating at an increasing rate, seem to indicate a total expenditure far in excess of the previously stated minimum. This substantial increase is reflected not only by the rapidly growing needs for additional prison and mental hospital and other institutional capacity, but also by the growing importance of public works as a field for the permanent investment of the vast accumulations of capital in this country.

The profession's interest in this great program has many roots; but its immediate interest, which must be aroused and sharpened into action, is twofold:—first, as a profession, in seeing that the policy and procedure adopted by the several states are consistent with the fundamental principles underlying professional practice; and second, as well informed citizens, in seeing that conditions created insure against planning which produces abortive architecture, waste of public funds, high maintenance and operating costs, and the intrusion of purely political considerations. The interest of the architect as a citizen and tax-payer who knows how buildings should be designed and constructed, assumes the quality of a real and compelling responsibility. Very generally the profession has recognized and accepted the responsibility with which specialized knowledge automatically clothes itself. The success or failure of representative government depends largely upon the effectiveness of the well informed, articulate minority in preventing blunders and insisting that whatever is done shall be done in the interest of the public, whose money is being spent. Indeed, that purpose is at the very core of the professional idea. This is the time, it seems to me, to design and construct the machinery,—or at least to design it,—for the wise and economical execution of this impressive public building program. The profession must not, by default, permit the designing of this machine by inept, ignorant and selfish hands. If the profession does not seize the opportunity to secure proper legislation, a situation may be expected to develop similar to that which has aroused the indignation and protest of the architects of New York. Often, things done are ridiculously difficult to undo because they get tangled with those imponderables in politics which stubbornly refuse to give way to reason, logic and common sense, but which grow out of and turn upon wholly irrelevant conflicts between personal aims and aspirations, grudges, petty prejudices and struggles for individual advantage.

In 1899, upon the insistence of Theodore Roosevelt, then governor, the state of New York stepped into the van of progress by creating the office of state architect. This happened after the capitol had been 30 years building and not completed. In 1909 the enactment of the public buildings law definitely fixed the state architect's duties, gave him authority over all buildings constructed with state funds except armories, and established supervision of architecture in connection with state buildings as a function of state government by creating the Department of Architecture. Until January 1, 1927, the state architect, like the attorney general, rendered his professional services to the legislature, the governor, and to all departments, boards and commissions to which funds were appropriated for the construction of buildings. These other state agencies were the state architect's clients, and he served them just as an architect in private practice serves his clients. The state architect's practice, however, assumed a scope and proportion far beyond ordinary practice; his planning and budgeting were for the whole state. "Where to build," was a more important question than "what to build." The planning and construction of state hospitals for the insane formed not a problem of one building or a group of buildings, but one of a coördinated state-wide service balanced

against population needs. Architecture as a function of government is, in part, regional planning, and takes on some attributes of statesmanship. Programming and budgeting the building needs of a state as a preliminary to the framing of appropriation bills are work for which the architect is peculiarly well qualified by training, experience and habit of mind.

Until reorganization became effective, the public buildings law in the state of New York clothed the state architect with authority to secure the services of architects in private practice on individual projects. This authority was used in many cases where such services were beneficial to the state, either in expediting work or by bringing to bear upon the solution of special problems specialized knowledge and experience. The law worked well. It provided for tapping the great reservoir of competent architectural service available, and at the same time centralized control in an official who was sympathetic with and understood established procedure and knew how and where to secure the services required. The high standards of design and execution and the low cost of services attest the wisdom and success of the law. But all of this has been cast into the discard to embark upon an experiment in working out a mistaken theory of organization which already has proved disastrous. The Department of Architecture has been abolished, and its duties transferred to a Division of Architecture in the Department of Public Works. The state architect has been stripped of his former responsibility and authority and subordinated to the Superintendent of Public Works. Supervision of construction has been transferred from the state architect to the head of the department's engineering division. The designer no longer controls the execution of his design. As a function of government in New York, the practice of architecture is being ignominiously dragged through the mire. And to complete its prostitution, legislation is now pending which changes the title of state architect to "Commissioner of Architecture" without requiring the appointee to be an architect!

State Office Building, Albany
Sullivan W. Jones, State Architect

I have drawn a somewhat detailed contrast between the past and present conditions in New York with a double purpose:—first, to indicate to the profession what may be expected to happen in other states; and second, to show that before architecture and public building were sacrificed upon the altar of the great god "reorganization," whose feet are of political clay, the procedure was in substantial accord with the policy laid down by the Institute many years ago and reaffirmed by the regional conference held in Albany on February 28: "The public interest is served best when the official architect, federal, state or municipal, may function freely and independently in serving the departments of the government, and provision is made for the employment of competent and experienced architects in private practice in connection with the design and construction of important public buildings."

What has happened in New York may have a long trail of disastrous consequences, because of the state's pioneer work in establishing a wise and economical procedure in the construction of public buildings, and in formulating and financing its unprecedented construction program. Unless the habitual tendency to follow in the footsteps of the leader is checked, we shall have other states using New York's retrogression as full justification for standing pat or following a similar course. Let there be no mistake about it,—New York has relinquished its leadership, lowered its standard, and retreated to the dismal period when architecture in connection with public buildings was counted among the prizes in the patronage grab bag. The issue in New York has now become enmeshed with the political imponderables. New York has made itself the battleground upon which not a local but a national issue is being fought out. The New York profession is making a splendid fight, in which it has the whole-hearted and enthusiastic support of the entire building industry and the civil engineers. The support of the profession everywhere should be thrown behind the architects of New York. If they are defeated, the action will shift to other states, and the profession will be confronted with the necessity of conducting a disheartening defensive campaign. Every effort must be made to reëstablish architecture in its rightful place in state work to insure that the public funds shall be expended in such a way that the buildings will be efficiently planned, properly designed and economically built.

THIN SLAB CONCRETE FLOORS OVER STEEL JOISTS

FLOOR CONSTRUCTION SYSTEMS EMPLOYING LIGHT STEEL STRUCTURAL MEMBERS IN CONJUNCTION WITH A CONCRETE SLAB POURED IN PLACE WITHOUT FORMS

BY
C. STANLEY TAYLOR

SEARCH for improved materials of construction and for better methods of utilizing the materials already at hand has been going on ever since man first undertook to erect shelter. Within comparatively recent years the materials employed for the structural elements in buildings have been the subject of extensive research, directed toward greater economies through the elimination of unnecessary or surplus material and through improved methods of putting the structural members together to form the desired kind of building. Wooden construction has been largely superseded for important structures by the use of steel and concrete because of their fireproof characteristics, and because their greater strength permits their use in buildings of great size.

The use of both steel and concrete for structural floor systems has developed within the lifetime of living architects and engineers. Reinforced concrete has been employed only for about 30 years. Structural steel construction has a history running back approximately a half-century. No better materials have been developed, but the method of utilizing these two basic structural materials has been undergoing constant improvement. Steel and concrete have been used together in practically all modern buildings, especially for the construction of floors. Local market conditions and the availability of materials, together with the size and height of the structure have been the governing factors determining the choice of reinforced concrete or structural steel framing for any given building. In some areas for buildings up to 10 or 12 stories in height reinforced concrete has proved to be very economical. Steel has universally predominated for taller structures, and in certain sections it is cheaper than concrete even for lower buildings. Methods heretofore employed for the use of steel and concrete for structural floor systems have been considerably more expensive than wood joist construction formerly employed, due largely to the need for formwork to support the concrete slabs during the construction process and because the dead load imposed by the resulting floor system has been relatively high.

There has recently come into general use a new system of floor construction employing a relatively thin concrete structural slab supported by light steel joists in which the need for formwork has been eliminated by the use of a reinforcing material which combines the functions of a form and slab reinforcing. In order to acquaint architects and builders with the present state of development of this system, the subject is divided under these different headings:

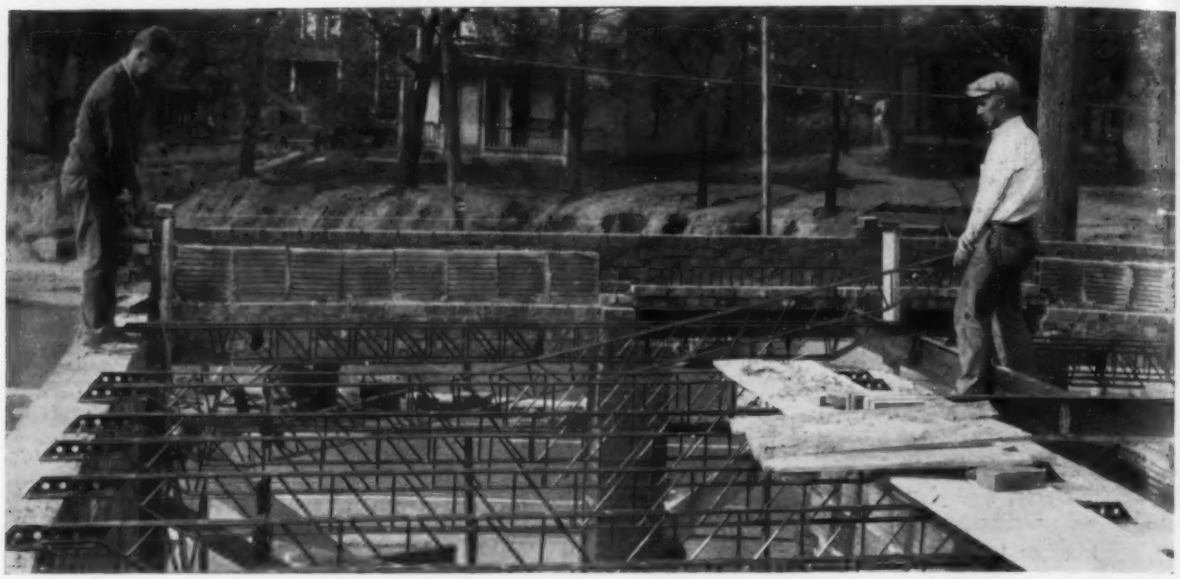
1. Summary of Thin Slab Concrete Floor Systems.
2. Characteristics of the new Floor System.
3. Fireproof Qualities.
4. Insurance Ratings.
5. Building Codes.
6. Types of Steel Structural Members.
7. Typical Load-bearing Capacities.
8. Methods of Installing Steel Members.
9. Slab Reinforcing and Supporting Materials.
10. Methods of Installing the Concrete Slab.
11. Ceiling Construction.
12. Specifications.

The data upon which this article is based have been obtained through engineers, architects and builders who have successfully employed this type of construction; from the manufacturers of the various materials used in the system; and with the coöperation of the American Institute of Steel Construction.

Summary of Thin Slab Concrete Floor Systems

Reduced to its simplest terms, this floor system consists of four elements: the steel joist or structural member; the material used to support and reinforce the slab; the concrete slab with its finished floor surface; and the ceiling beneath. The steel joists are light structural members of which several types are now on the market. These types include rolled steel sections having solid webs and flanges, rolled steel sections with expanded or perforated webs, and various types of built-up members usually of truss form composed of bars, tees and angles welded or riveted together in accordance with various designs. These structural members are placed upon the building framework or walls without riveting or welding and, being entirely fabricated in the shop in standard lengths, require no cutting or fitting at the site. They are held in place by means of wire or metal bridging and bracing and by various types of clips or anchors, as will be seen in several of the accompanying illustrations.

On the tops of the joists, which are usually spaced from 12 to 30 inches apart, metal lath or one of the newer types of welded mesh reinforcing, having a waterproof backing which eliminates use of forms, is spread and attached to the truss by means of clips or wedges. After conduits and pipes are in place, a concrete slab is poured directly over the supporting and reinforcing material. Where a wood top floor is contemplated screed chairs and sleepers are



Steel Joists of Average Length Are Light Enough to Be Handled by Two Men

set before the concrete slab is poured. No temporary forms are required. To the underside of the truss metal lath is wired or attached by various devices designed for the purpose and a plaster ceiling applied in the usual fashion.

Characteristics of the New Floor System

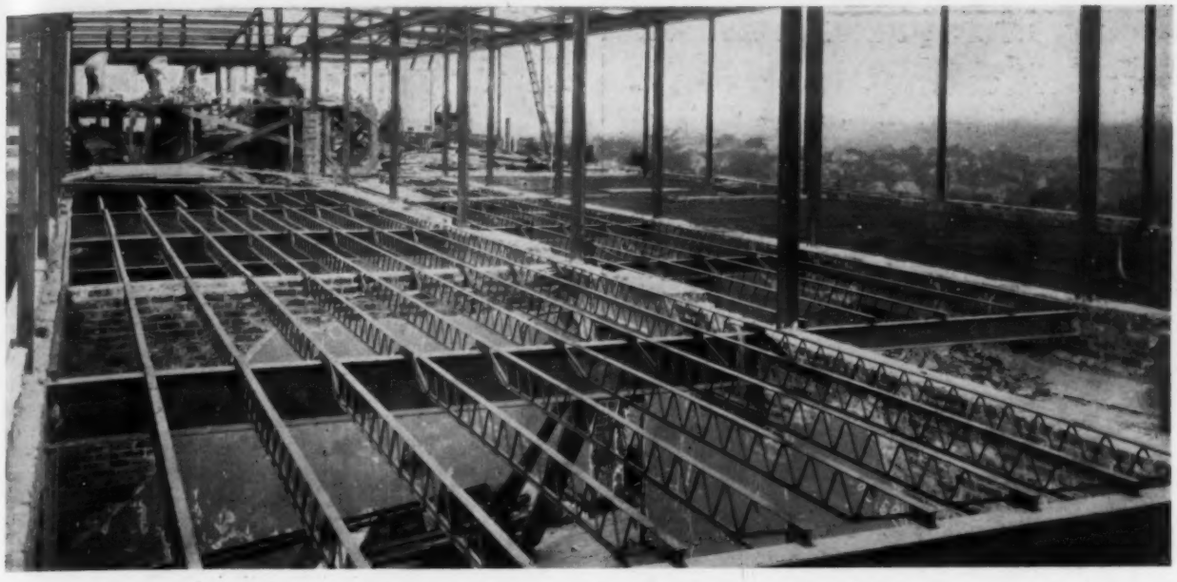
The resulting construction is considerably lighter than a reinforced concrete floor or a floor composed of structural steel shapes encased in concrete with the usual reinforced concrete slab above and between the beams. The average weight of a thin slab concrete floor on steel joists, including the metal lath and plaster ceiling, the weight of joists, the slab and wood top floor, is from 40 to 50 pounds per square foot. This floor system is primarily designed for relatively light live load capacities. For practically all spans possible with standard steel joists or trusses, live load capacities range from 40 pounds to 150 pounds per square foot. This range is obtained largely by the spacing of the steel joists. While joists are provided for any local condition, the system is generally used for light-occupancy buildings.

A number of important economies are inherent in this type of construction. The relatively light dead load lessens the load imposed upon columns, bearing walls and foundations, resulting in a saving in the materials required and in cost of these parts. There is an obvious saving in the amount of material employed, less steel and less concrete being required for this light-weight floor construction than are needed for other standard types of floors, and there is a very marked saving in the amount of labor needed to install these materials. The entire elimination of formwork is perhaps the most important single factor in lowering the cost of this new floor construction system. Forms are expensive to build and to take down, and the material used in the forms has little salvage value. Formwork contributes nothing to the ultimate value of the structure.

Practically all types of steel joists permit conduits and pipes to be run through the floor between the ceiling and the concrete slab, either by carrying the pipes through the open webs, when this type of member is employed, or by carrying them around the ends of the joists when solid web members are used. This opportunity for utilizing waste space within the floor itself eliminates the need for extra slab thickness to conceal conduits and pipes, often necessary in reinforced concrete or fireproofed steel construction. The rapidity with which the floor can be constructed contributes further saving. There is no riveting or fabricating on the site. The elimination of the forms saves time as well as materials. The self-supporting floor permits other operations to be conducted on floors immediately below that under construction, and mechanical installations can be carried on while the floor is under construction. These factors shorten the time required for completing the building, resulting in lower interest charges on the capital tied up during the construction operations and advancing the date when the building begins to produce an income.

Fireproof Qualities

It is not generally realized that thin slab concrete floor construction upon steel joists enjoys the rating of "fire-resisting" construction. The steel joist type of floor has been in use for 20 years. In all this time there has never been a reported instance where fire has structurally damaged a steel joist floor. Fire tests by impartial engineers have proved this fire-resisting quality to be due to the inherent characteristics of the floor system and not to a fortunate lack



Steel Joists Are Easily Placed Without Field Fabricating or Riveting

of serious fires in buildings employing this construction. The reasons for this characteristic are of considerable interest. Many materials are incombustible at even high temperature, but no material is immune from expansion and contraction with variation in temperature. As an example of the extent of this expansion, a steel beam 20 feet long will expand about 3 inches when raised from 100° to 1600° Fahr. Concrete expands in a similar manner, the rate of expansion varying with the aggregate. When a member such as a steel beam is heated on one side while maintained at ordinary temperatures on the other side, the resulting expansion will cause distortion or buckling toward the heated side. Similarly, if the beam is rigidly fixed at its ends, and heated uniformly or otherwise, the expansion that is bound to take place results in distortion. However, a beam that is loose at one or both ends will simply expand in length without distortion, if uniformly heated. As a result, a beam resting on brick walls will successfully withstand greater temperatures than a beam riveted to columns.

Another effect of heat on building material is on its strength. In general, as the temperature rises the strength decreases slowly to a critical point, after which it drops off rapidly. Structural grade steel, however, is an outstanding exception. Its strength is actually about 15 per cent greater at from 600° to 700° Fahr., than at room temperature. With the temperature raised to nearly 1000° Fahr., a steel member will still safely carry its designed load provided the member has been permitted to expand without distortion. Analyzing this, certain obvious conclusions are drawn as to the proper methods of fireproofing structural members: First; any heat that reaches a structural section in a building should be uniformly distributed over the entire area of the section. Second; the members should be free to expand as heat is applied, or they should be so protected as to permit but a moderate increase in temperature.

It has also been established that fireproofing with plaster on metal lath is highly effective, probably because it employs a principle of surrounding the steel member with a dead air space. Plaster is highly resistant to the transmission of heat, but when applied on relatively smooth surfaces it has no protective value. This is because ordinarily adhesion will not withstand the stresses resulting from high temperatures. However, when applied on metal lath or other reinforcing fabric of suitable design, a mechanical bond is secured. The plaster is not only held to its work, but is reinforced in every direction against temperature stresses. The result is a tenacity or durability beyond most other combinations of materials. Many laboratory tests have been made that have consistently indicated the effectiveness of plaster as a heat resistant and have established plaster on metal lath as a fireproof detail in construction. Experience in actual fires has proved these tests.

For the reasons just indicated, steel joists as employed in this type of floor or roof construction are not fixed at their ends but are free to expand and contract with changes in temperature. The joists are surrounded by a dead air space. If the fire conditions under a floor panel are such that the temperature in this dead air space is not raised above 1000° Fahr. until the fire has burned itself out or been extinguished, the only resulting damage will be a calcined ceiling. Fire tests conducted by the Pittsburgh Testing Laboratories on an actual floor panel constructed with open web steel joists of the truss type and fully loaded, indicate that a temperature of 1800° Fahr. can be maintained for four and one-half hours under the floor without structurally damaging the joists. The floor panel used in this test had a

A Simple Method of Anchoring the Ends of Steel Joists in Masonry

Details Showing One Method of Side Anchoring Open Web Joists

metal lath and plaster ceiling beneath the joists. Both insurance rates and building codes are reflecting an ever-increasing approval of the steel joist floor as giving fire-resisting building construction.

Insurance Ratings

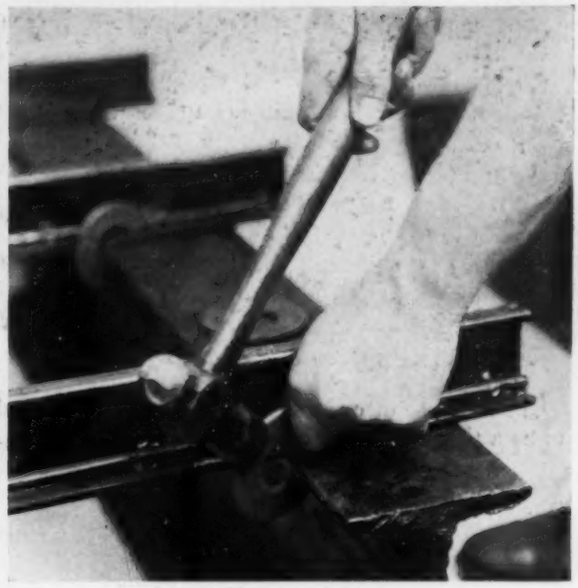
Insurance rates properly influence the architect's choice of structural floor systems. These rates are based on experience. When steel joists were first brought on the market in 1907, there was little to guide the insurance companies. The strip steel joist (sometimes called "metal lumber") came into prominence in 1921 when certain insurance companies recognized and granted steel joist floor construction the minimum basic fireproof rates. This rating is given steel joist floor or roof construction by practically all companies at the present when certain required conditions are met. These conditions involve properly fireproofing the structural portions of the floor. The ceiling plaster should be applied to and form a good mechanical bond with the ceiling lath. The usual practice is to use a 3/8-inch rib lath with ribs turned up or a flat diamond-mesh lath furred to the bottom cords of the joists with furring channels or rods. The joists should be placed on (not riveted or bolted to) the supports to allow the joists to expand or contract without distortion under actual fire conditions. Where wood finish floor is used, wood nailing strips should be blocked up or placed on screed clips to allow at least 1 inch of concrete to come between the wood strips and the joists. This construction takes the minimum basic fireproof rate for the slab thickness used, the same as in concrete joist floor construction. Of course it must be appreciated that this rating applies to the floor system only, and the ultimate insurance rates for any given building are influenced by other factors. The use of non-fireproof partitions or the improper fireproofing of the structural frame may penalize a building and increase its rates.

Building Codes

The architect is also largely guided in his choice of structural systems by local building code limitations. Building codes are constantly undergoing evolution and change, and no definite statement can be made with reference to the acceptance of this type of construction in all cities. In general, thin slab concrete floors on steel joists are recognized as fireproof floor construction in all but a few of the important building centers. It must be appreciated that the method of handling approvals of new materials and construction methods by building departments varies. In most cases no mention is made of steel joist construction in printed codes. The usual recognition consists of an interpretation of existing sections of the code. In some cities only a few officials in the building department know the rules on this type of construction. Such limitation as may affect a particular building may be easily determined by writing the building commissioner, the American Institute of Steel Construction, or the larger manufacturers of steel joists, outlining the type and location of the building under consideration.

Cities such as Pittsburgh, Cleveland, Rochester, Cincinnati and St. Louis approve this construction for all types of buildings in all fire zones. Philadelphia approves the construction for all types of buildings in all fire zones under existing sections of the code that call for protection of the bottom chords of the joist with 2 inches of concrete or gypsum. The method employed for taking care of this special requirement is discussed later under "Ceiling Construction." The building departments of Washington, Detroit and Buffalo have given their approval of steel joists for all types of buildings within a specified height limitation that confines the use of this floor system to seven- or eight-story buildings. This measure of caution seems unwarranted to many familiar with the performance of these floors. It is obvious that the merit of this construction is not

Most Open Web Type Joists Use a Ceiling Bracket to Extend Lower Chord to Wall for Ceiling Lath



End Anchorage of Steel Joists on Structural Steel Girders by Means of a U-Shaped Wedge

different in the fourth floor from what it is in the thirtieth floor of a building. New York, Chicago and Boston are the large cities that do not at present permit the use of steel joist construction for fireproof buildings in the more rigidly restricted building zones. With the architectural departments of such states as New York, New Jersey and Illinois specifying thin slab concrete floors on steel joists on state projects involving millions of dollars, and with a 35-story building under construction in Pittsburgh employing this floor system, it is only a matter of time until departments will give further recognition to the merits of this system where limitations now exist.

Types of Steel Structural Members

In this article the term "steel joists" is used in a general sense to connote all forms of light steel structural members employed in thin slab concrete floor construction. Steel joists are sold under various names and are sometimes classified as rolled sections, metal lumber (pressed sections), bar joists and trusses. For our purpose here, however, the only general division of these members is into two classes,—those having solid webs similar to ordinary I-beams, and those having open webs more or less resembling inverted bridge trusses. Typical steel joists of these several types are shown in the accompanying pages by means of illustrations from photographs. The reader is referred to these illustrations for a general comparison of the characteristic features of the several types. In later paragraphs there is given a brief summary of the design features of the more important types, but no attempt is made in this article to distinguish between the merits of the various designs. Each type of steel joist has its uses, and the designer contemplating the adoption of steel joist construction should communicate with the manufacturers of these products, obtain their design formulæ, load tables, weights and dimensions. Accompanying this article will be found a typical load table showing the safe loads for various spans and spacings, from one manufacturer's load tables, which has been greatly condensed.

Solid Web Members

This type of steel joist is manufactured in various ways. The simplest to describe is a light-weight rolled section similar in shape to a standard I-beam. These joists may be used as structural steel members riveted to the steel framework, and when so used are not properly classified as steel joists but should be considered as a special type of structural steel framing. They are also manufactured with mitered ends with bearing plates welded or riveted below the top flanges. These members rest on bearing walls or structural framework without riveting and are treated like other types of steel joists. The mitered ends provide transverse pipe spaces and also eliminate metal not required for strength. Another type of solid web section is sometimes called the "five-member" section and resembles a welded plate girder. It is composed of a web made of strip steel with four angles welded to the upper and lower edges forming flanges similar in shape to an ordinary I-beam. These also have end supports welded or riveted below the top flanges and may be mitered or straight at the ends. Metal lumber is manufactured in various ways, generally using cold rolled or pressed strip steel in channel form, or in I-beam form made by welding or riveting angles to the back of a channel.

Cross Bridging of Open Web Joists

The latter type of construction is sometimes referred to as a three-member section.

Open Web Steel Joists

This type of joist is characterized by its truss design which leaves open spaces within the webs. For our purpose these steel joists may be classified into two subdivisions, those having round top chords, usually composed of two bars separated by the web members, and those having solid top flanges. This distinction is of value, inasmuch as the method of attaching metal lath or other types of slab or reinforcing is necessarily different for these two types of joists. Steel joists with round top chords are variously called bar joists or trusses, and are built up of steel bars of structural grade steel with the web members usually arc-welded to the upper and lower chords. The lower chords are usually brought up at an angle near the ends of the joists to be joined to bearing members to which the top chords are also attached. The principal difference between various makes of these so-called bar joists or trusses lies in the design and spacing of the web struts and braces. The end bearings are usually made of I- or T-sections.

Open-web steel joists with solid top flanges are manufactured in several ways. One type employs a special rolled T-section for the chords with webs composed of bent rods in truss form which are welded at the bends to the edge of the stem of the T-sections. Another type employs a special section for the top chord and an L-section for the bottom chord and light angles to form the truss web. A third type is made of a standard rolled I-beam, the web of which is slotted, and then the beam is spread after heating, to expand the web. The resulting member has the appearance of a lattice truss but is actually composed of a single piece of metal except for an inserted center strut and special members which may be used to form end bearings. A feature often stressed by the manufacturers of open web steel joists is the opportunity for carrying pipes and conduits across a floor span through the webs. This feature is often of considerable value, although for long runs it is frequently necessary to utilize the space beneath the mitered ends of the joists either of the open-web or solid-web type because of the difficulty of setting in place long pieces of pipe after the joists have been spaced and bridged. Most of the manufacturers of solid-web joists will perforate the webs where required to accommodate conduits or small pipes. If the designer specifies or so arranges piping as to require the contractor to carry it through the open webs of the truss type joist, the builder should be permitted to get the longer pieces of pipe in place before the joists are firmly anchored and bridged. Cast iron soil lines, of course, may be erected at any time, because the short lengths employed can readily be handled, even when relatively limited joist space is available.

Methods of Installing Steel Structural Members

This sequence of operation is generally employed for all types of steel joists. Manufacturers usually ship the joists with tags indicating their length and type, and sometimes they are specially labeled in accordance with the builders' construction schedule. Unless the building is ready for placing the joists, they are stacked on the ground, preferably on racks which support the ends, permitting the joists to hang in place on the racks without resting one upon the other. If piled on the ground and laid flat, the longer members are subject to some injury due to bending, although they can always be straightened afterwards without difficulty. When the work is ready for placing the joists, they are hoisted to the proper floors and immediately laid in the floor panels with the ends resting on the proper supports. All except the very long members can usually be handled and distributed to the correct spacing by sliding them along to supporting members. The spacing is usually accomplished by means of a wooden block or other template, and is very rapidly accomplished. At this stage a few planks may be laid over the joists as a temporary walking surface while the subsequent operations are being performed. No heavy loads should be wheeled over or carried on this planking until after the joists are anchored and braced.

Anchoring Joists

When the joists rest on masonry walls, it is customary to anchor the ends of every third or fourth joist by means of rods or ties provided by the joist manufacturer for the purpose. The accompanying illustrations indicate several methods for end anchoring. Joists which are parallel to masonry walls should be side-anchored to the walls at intervals corresponding to the specified interval for bridging. The usual anchorage is a bent rod which is embedded in the brick or tile work. With reinforced concrete construction it is customary to provide wire ties carried through the framework, the ends of which are subsequently wrapped around the first parallel joist.

When steel joists rest on structural steel framework, the ends are usually clipped to the upper

flanges of the steel girders by means of C-shaped clips driven over the flanges and the corresponding flange of the end support of the joist. Another method is to use a bent bar hooked into the web of the joist or into the end support and bent over the farther flange of the steel girder.

When the joists are used in conjunction with reinforced concrete beams, they may be set on the upper edges of the forms and bent rod anchors carried down into the spaces to be filled with concrete. If the reinforced concrete beam is cast before the joists are set in place, simple wire or bent rod anchors may be used similar to those employed over steel girders.

It should be noted that these anchors are not required on all joists, and in no case are they so rigid as to prevent the expansion and contraction of the joists under temperature changes. They simply serve to keep the joists from moving during the construction process, the weight of the finished floor being sufficient to assure their remaining in position after the floor has been completed. Anchorage is very important, however, for the end joists parallel to beams or girders when a reinforcing fabric of the welded mesh type with waterproof backing is employed for the construction of the top slab, as this type of fabric is usually stretched by a mechanical device which has sufficient power to misplace the end joists unless they are firmly anchored.

Bracing and Bridging

The next operation is to run bridging at intervals of not greater than 8 feet across the joists to prevent their movement during the operation of laying the floor slab. The bridging performs no structural function and is not designed to transmit loads from one joist to adjoining joists. Several types of bridging are employed as shown in accompanying illustrations. Some manufacturers provide special forms of metal bridging which are merely clipped or bent in place, but the usual method is to use annealed or stranded wire in one of three ways.

Cross bridging employs two strands of wire wrapped around solid web joists or around the upper or lower chords of open web joists and crossed diagonally between each pair of members. Where the wires meet, a rod is inserted, and they are twisted taut rigidly, holding the joists in place.

Two-wire straight line bridging consists of parallel wires carried above and below the upper and lower cords of open web joists, each pair of wires being twisted at two points between and across to the adjoining joists to take up the slack and form a rigid tie. This system requires four lines of wire instead of two. Single-wire straight line bridging, also used on open web joists, employs a wire for the upper chord and another wire for the lower chord, which is carried through the webs and wrapped once around each chord running horizontally to the next joist, where the operation is repeated. No twisting is employed, hence the operation must be carefully performed to be sure that the wires are entirely taut.

Parallel Bridging by Means of Taut Wires

Attaching Ceiling Brackets

Most types of open-web joists have lower chords which slope up to meet the bearing plates leaving a gap between the horizontal ceiling line of the center part of the joist and the side wall. When metal lath ceilings are to be hung to the joists, this gap must be bridged to permit the firm attachment of the metal lath close to the wall. For this purpose joist manufacturers make various types of ceiling brackets, most of which are of such design that they may be put in place without the use of tools. They function to extend the horizontal line of the lower chords of the joists to the wall line. They bridge the spaces frequently employed for concealing pipes.

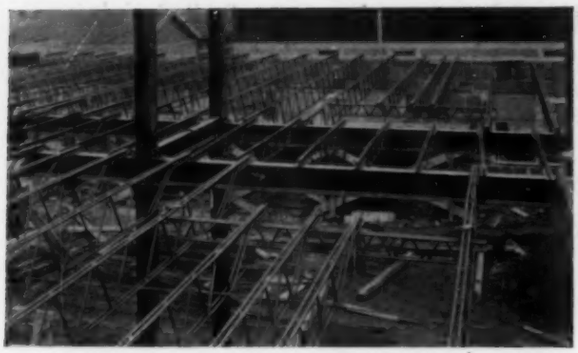
Installing Headers

Most joist manufacturers provide headers for use in framing around small openings. These headers are usually angles of small channels which are attached to the trimmer joists by means of hangers at any desired points, the bearing faces of the headers being dropped below the floor line a sufficient distance to bring the shorter intermediate joists to the level of the others.

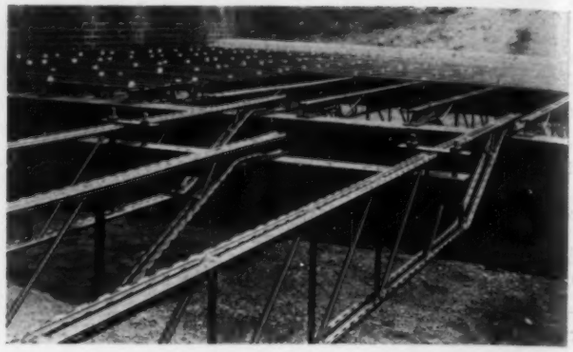
Headers may be employed with single trimmer joists for small openings generally not exceeding 5 feet in length, and with double trimmer joists for larger openings up to 8 feet. Larger openings should be framed with structural steel members.

Installing Pipes and Conduits

Mention has been made of the facility with which pipes and conduits can be concealed between the floor and ceiling with steel joist construction. With the solid-web type of joist, longitudinal lines of pipe are carried between joists, and transverse lines are carried close to the wall in the triangular spaces left under the mitered ends of the joists. Some of the manufacturers of solid-web joists will perforate the members at designated points for the insertion of flexible electrical conduit or small pipes. The open-



Small Open Web Joist Used as Header Beam



Steel Angle Header Beam Bolted to Joists

web type of joist permits the installation of transverse as well as longitudinal lines of piping at practically any point in the floor section. It must be remembered, of course, that long pieces of rigid pipe cannot be inserted through the webs after the joists are firmly fixed in place unless there is an open section at some point large enough to permit the lengthy pipe to be lifted and slid in the desired space. Contractors who neglect to take this matter into consideration are often disappointed in their ability to utilize the web spaces for pipe lines, and thus frequent criticism is heard on this point. By having the mechanical trades carrying on their work while the floor joists are being set, this difficulty can be entirely obviated.

Cast iron soil lines can usually be placed at any point because of the short lengths of pipe employed. Surprisingly large pipe lines of this type can be entirely concealed within the floors. One caution is of the utmost importance. Under no circumstances should any of the web members of the truss type steel joist be cut or bent to permit placing of pipes or for any other purpose. Another caution to note is that the weight of the horizontal lines of piping carried through the steel joist floor must be taken into consideration in designing the load-bearing capacity of the floor section. An installation was recently discovered where a very large water main was carried transversely through the webs of truss type joists along the center line of the floor span for which no provision had been made in the design of the floor. The pipe was run as an after-thought and imposed a dead load which materially reduced the margin of safety and threatened a failure of the floor.

While it is desirable to plan the installation of long runs of pipe while the joists are being installed, it is possible to carry on most of the mechanical installations after the floor slabs have been completed. This permits the contractor to place his joists, pour the slabs and enclose his building without delays and interruptions on the part of the electrical and plumbing trades. This reduces the time required to complete the building, effects a saving in the material and labor required by the mechanical trades, and facilitates winter construction work.

Slab Reinforcing and Supporting Materials

At the present state of development of thin slab concrete floors, only two types of material are employed for the support and reinforcing of the concrete. Metal lath has been the usual material. Recently a new type of welded mesh reinforcing with a waterproof backing has been introduced for this purpose and it has already proved to be excellent.

Metal Lath

Ever since the introduction of metal lumber and the earlier types of steel joists, metal lath has been used for reinforcing and supporting the slab. In theory the metal lath functions as a reinforcing material, and it is for this reason primarily that rib lath is invariably employed. The ribs are deeply embedded in the concrete slab; they are solid metal and have approximately the same effect as reinforcing rods of equivalent sectional area. Some designers do not consider the perforated mesh of the lath as effective reinforcing. Others take the contrary stand. Obviously, the perforated mesh largely remains on the under side of the slab and is not wholly enclosed in the concrete, as the latter simply keys through the mesh and gets a grip on the lath without totally surrounding it.

Whatever the design theory may be, experience has developed certain standard practices. The recommended practice is to use ⅜-inch rib lath weighing not less than 4 pounds per square yard for joist spacings up to 25 inches on centers; and to employ ¾-inch rib lathing weighing 4.5 pounds per square yard for joist spacings in excess of 25 inches and up to the permissible maximum of 30 inches to occasionally 36 inches. Some engineers and architects have employed lighter lath weighing 3.5 pounds per square yard for floors in which the joists are spaced not over 16 inches on centers, but this light lath is not normally recommended.

The highest grade lath should invariably be employed, and it should always be painted. Care should be exercised to select a lath having enough openings to effect a good key with the concrete without choosing a mesh that is so large as to permit exces-

Rolled I-Beam Section With the Web Slotted and Expanded Into a Lattice Truss

A Typical Installation of Solid Web Steel Joists Showing Method of Bridging

sive waste of cement and aggregate through the lath when the slab is poured.

Some designers utilize temperature bars in the concrete slab when metal lath is specified, which generally consist of ¼-inch round rods on 18-inch centers. These are sometimes placed parallel to the joists resting on the ribs of the lath on the theory that the ribs take the strains in one direction and the rods take the strains at right angles to the ribs. In other cases the rods are placed at right angles to the joists and parallel to the ribs of the lath and are usually put in place while the concrete is being spread. Another practice is the use of welded mesh reinforcing laid over the ribs of the lath.

Welded Mesh Reinforcing with Waterproof Backing

Within a relatively short time there has been introduced a new type of material especially designed for the construction of thin slab concrete floors over steel joists. It consists of a welded wire mesh made of 12-gauge wire with a spacing approximately 3 inches for the longitudinal wires and 4 inches for the transverse wires. The mesh is heavily galvanized. A typical mesh of this type has a cross sectional steel area of .035 square inches per foot of fabric for the longitudinal wires and a cross sectional area of .026 square inches per foot of fabric for the transverse wires. This reinforcing is ingeniously attached by means of secondary woven wires to a heavy double waterproof backing made of two layers of a special paper stock with a waterproof membrane between the layers. The attachment of the backing to the reinforcing material is so arranged that a space of ½-inch is left between the two which allows the concrete to flow around and securely embed all of the reinforcing members. The backing, which functions purely as a form, is watertight to prevent any leakage of water or fine aggregate and is of ample strength to support the concrete when being placed.

This type of material usually comes in long rolls which permit it to be laid quickly over a large area, reducing wastage, since over-lapping is minimized, and giving continuity of reinforcement. Ease and rapidity of installation are also important considerations.

Installing Metal Floor Lath

The sheets of lath are unpacked from bundles and spread over the joists, the ribs being placed at right angles to the joists. The outside ribs of adjoining sheets are nested and wired to form a continuous surface. The sheets are lapped with a minimum lap of 2 inches over a joist and secured to the joist. Joists are spaced to secure a minimum lath wastage at end laps as well as for the maximum efficiency of the joists. The method of fastening the lath to the joists varies with the different types of joists as is necessary because of the variety of top-members.

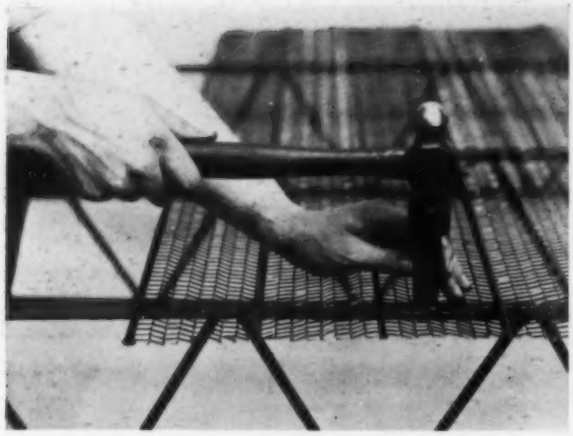
Small wooden wedges are employed with steel joists having round top chords to attach the lath to the joists. The wedges are driven through the open mesh of the lath between the top chords. With steel joists having solid top flanges, special wire clips of various types are provided by the joist manufacturers. These are inserted through the open spaces in the lath mesh and clamped around the joist flanges either with special tools or by means of ordinary pliers. Wedges or clips should be used at not greater than 8-inch intervals along each joist.

When a wooden finish floor is to be used screed chairs are attached to the metal lath or to the upper chords of the joists by clips extending through the lath and sleepers are set in these chairs at least one inch above the lath.

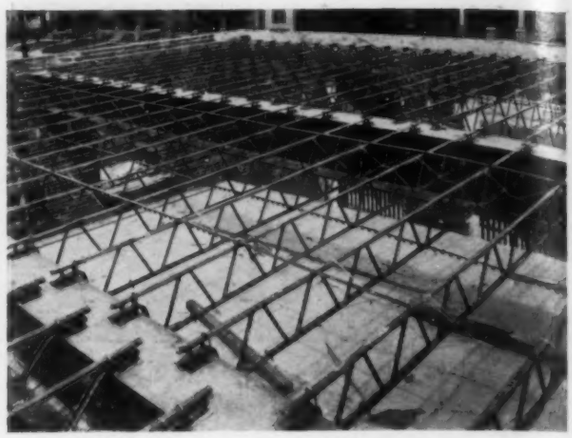
Pouring the Slab on Metal Lath

The concrete slab usually employed is 2 inches thick for short spacings and may run up to 3 inches for wider spacings. The latter thickness is recommended for garage floors and for buildings subject to vibration or heavier live loads. A mix of 1:2:4 is standard. Care must be exercised to keep the mix quite dry in order to minimize wastage.

The concrete is poured over the lath from barrows or dump buckets. Care should be exercised to avoid dumping heavy loads at one spot, although a well-installed lath should not be injured if the load is carefully dumped and immediately spread. The usual methods of finishing concrete slab are followed beyond this point.



Wooden Wedges Are Used to Hold Metal Lath



Notched Spacing Bars Used With Wire Cross Bridging

Installing Welded Mesh Reinforcing with Waterproof Backing

This type of material is usually supplied in long rolls 4 feet wide. As soon as the joists are ready to receive the floor, the reinforcing fabric with its backing is rapidly unrolled across the joists (using temporary planking to support the first sheet) and the roll is cut off at the end of the span. The sheet is then picked up and turned over into place so that the backing is next to the joists and the mesh on top. One end of the sheet is then wedged or clipped to the first joist adjacent to a wall or beam. This joist and that at the opposite end of the span must be strongly braced to the supporting wall or girder as previously described. Steel joists having round top chords provide an attachment of the mesh reinforcing by the use of special metal wedges, supplied by the reinforcing manufacturer, which are driven between two chord members engaging a longitudinal wire in each wedge. An accompanying illustration clearly shows the wedge and its use. With steel joists having solid top flanges, a simple wire clip is hooked over the further flange of the joist under the mesh, and the ends are bent around a transverse wire in the fabric. Four wedges or clips are used on this first anchored joist. To the other end of the sheet of fabric a stretching device provided by the fabric manufacturers is attached by hooking it over a transverse wire, and by carrying a special lug in the stretching mechanism over the flange of the last anchored joist. To facilitate the application of this stretching mechanism, a small piece of the fabric about 6 inches wide is cut from the end of the sheet to prevent the material buckling when the stretcher is used. By means of a lever and screw the entire sheet of fabric is drawn taut, the whole operation requiring but little time.

Wedges or clips of the type just described are then attached to the anchored joist to which the stretcher is applied, four such wedges or clips being used at this end of the sheet in the same manner as they were applied to the starting end. Thereupon wedges or clips are applied to each intervening joist down the length of the sheet, two attachments being made to each joist per width of fabric. As soon as the stretcher has been applied, this type of fabric will safely bear all ordinary loads, and workmen may walk freely over its surface to perform the wedging or clipping operations.

The adjoining sheet of fabric is then laid and stretched. Side joints should be lapped at least 2 inches; other, or end joints, at least 1 foot.

After the floor is covered screed chairs and sleepers are set in place where a wood finish floor is desired.

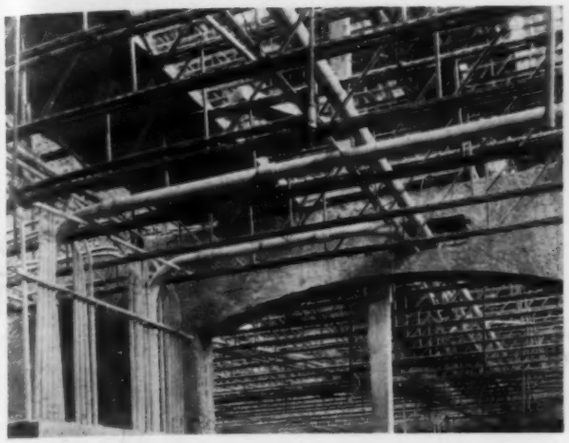
Pouring Concrete Slab Over Welded Mesh

With this type of reinforcing material the necessity for a carefully proportioned dry mix of concrete is removed, and the designer is free to specify whatever mix is desired and in accordance with any selected water-cement ratio. No material is lost through the fabric, hence there is some economy in the amount of concrete required. The waterproof backing has some insulating as well as dampproofing value and assists in the curing of the concrete by preventing its drying out too rapidly. The under side of the finished floor is clean and neat.

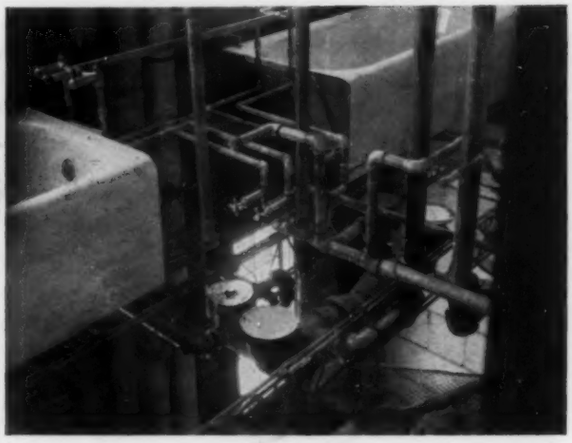
Ceiling Construction

The usual practice in the construction of ceilings under steel joist floors is to attach metal lath to the lower chords or flanges of the joists by means of wire clasps manufactured for the purpose, or by using short lengths of annealed wire carried over the lower flanges of open-web joists and twisted on the under side of the lath. Furring channels are sometimes used. The ceiling is then ready for plastering.

The building code of Philadelphia permits the use of steel joist construction in fireproof buildings providing the steel is protected by a 2-inch layer of concrete or gypsum. To meet this requirement local contractors usually hang the metal lath ceiling on light channels suspended 2 inches below the lower chords or flanges of the joists, placing the ceiling



Open Web Steel Joists Permit Placing of Pipes and Conduits Through the Webs



The Installation of Plumbing Pipes and Fixtures is Facilitated

before the floor lath or fabric is laid. Gypsum is usually employed for the fireproofing because of its lighter weight, and a layer is poured on the ceiling lath from above to the required depth, completely encasing the lower flanges of the joists. The gypsum (or concrete) penetrates the lath and forms an excellent key on the lower side.

SPECIFICATIONS

Standard specifications are published by all steel joist manufacturers and the makers of metal lath and welded mesh reinforcing material, covering the proper use of these particular products. Some are rather closely written, incorporating special features of the manufacturer's particular material; others are more general in their nature and permit competitive bidding. Where the architect feels that his client's best interests will be served by an outright specification, he should write the manufacturer's wording into his specifications. Where competitive bidding is desired, the specifications should be written with a view to placing all bids on a fair competitive basis as well as to insure proper construction.

The comments given here will supplement the information given in this article and will assist in developing a comprehensive specification.

Live Loads

The live loads should be specified for each floor or roof panel, rather than leaving this to the option of the manufacturer.

Partition Loads

Lighter partitions can be ignored or included as part of the specified live load. The weight per lineal foot of heavier partitions should be specified. Where heavier partitions are over and paralleled to the joists, good practice calls for extra joists to carry the partition load.

Floor Dead Loads

The floor dead load will vary with the floor slab thickness and type of finish floor used and can be obtained from any of the manufacturers. The steel joists themselves represent only about 10 per cent of the floor dead load, with little variation between different makes of joists. For this reason the floor dead load should be specified.

Basis of Design

If the A. I. S. C. specifications are to govern, the specifications should clearly state that, "the joists are to be designed in accordance with the American Institute of Steel Construction specifications for the specified floor loads." If other specifications are to govern, the specifications should clearly state the basis of design.

Spacing of Joists

Tie beams may or may not be used as joists. It is good practice to use a tie beam as a joist only where its deflection under full load approximates that of the joist. Joists may or may not be placed alongside of and parallel to the end walls in each panel. Good practice calls for these joists. The specifications should clearly state where tie beams are to be figured as joists and where joists are to be placed alongside of and parallel to end walls as well as the maximum center spacing of intervening joists. Under ordinary practice the maximum spacing of joists is 25 inches for floors and 32 inches for roofs. The solid web members of I-beam sections are not limited to this spacing when used as structural members, but practical experience with metal lath seems to establish these limits for best construction. Welded mesh reinforcing seems to permit wider spacings than are customary with metal lath, and 30 inches may be considered the maximum spacing for good practice with this material. In some types of buildings

Stretching Welded Mesh Reinforcing Fabric

Pouring Concrete Over Welded Reinforcing Fabric

and for certain loading conditions a closer spacing of joists should be specified. For example, good practice calls for a maximum spacing of 16 inches for garage floors.

Steel Joists

The specifications should require the manufacturer to furnish joists in accordance with his published dimensions to allow the architect or his engineer to check the correctness of the design. Where these data are not published, the architect should insist on the manufacturer furnishing complete detailed dimensions before allowing the contractor to quote on his material. This will allow the architect to intelligently compare and approve the particular makes of joists to be considered before the contract is awarded. The usual specifications that full facilities are to be provided by the manufacturer at all times for the proper inspection, chemical or physical, of the material and the workmanship used in the manufacture of the material, should be included.

Bracing

The steel joist has its center of gravity below the line of bearing and assumes its natural position when placed. The specifications should require that the end joists in every panel be anchored to the parallel wall or beam and intervening joists securely braced with bridging wire, bridging to be placed at least 8 feet on centers and drawn taut. This insures the joists holding their proper position during the erection period. The concrete floor slab and ceiling effectively brace the construction after they are in place.

Ceiling Lath

The ceiling lath and ceiling extensions are usually handled by the lather and should be specified as a part of his contract. The usual practice is to use a 3/8-inch rib lath with the rib turned up or a flat diamond mesh lath furred to the bottom chords of the joists with furring channels or rods. The lath specified should provide a good key for furnishing a mechanical bond.

TOTAL SAFE LOADING IN POUNDS PER SQUARE FOOT UNIFORMLY DISTRIBUTED

(Abstract of Table as published by one Open Web Type Joist Manufacturer)

This loading table is standard, and joists as shown in tables of dimension for both the American Institute of Steel Construction Specifications and the American Bridge Company specifications have been designed to meet these loading conditions.

(Under column headed Joist, first number gives depth in inches, second number in length of joists in feet.)

	Total	SPACING C-C OF JOISTS IN INCHES																
Span	Load	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	28	30
4′-0″	2528	632	584	542	506	475	446	422	400	379	361	345	330	316	303	292	271	253
6′-0″	1686	281	260	241	225	211	197	187	178	169	161	153	147	141	135	130	120	112
8′-0″	1856	232	214	199	186	174	164	155	147	139	133	127	121	116	111	107	99	93
10′-0″	2160	216	200	185	173	162	153	144	136	130	123	118	113	108	104	100	93	86
12′-0″	2928	244	226	209	195	183	172	163	154	146	140	133	127	122	117	113	105	98
14′-0″	2506	179	166	153	143	134	126	120	113	107	102	98	93	90	86	83	77	72
16′-0″	2784	174	160	149	139	131	123	116	110	104	99	95	91	87	83	80	75	70
18′-0″	3816	212	196	182	170	159	150	141	134	127	121	116	111	106	102	98	91	85
20′-0″	4160	208	192	178	166	156	147	139	131	125	119	114	109	104	100	96	89	83
22′-0″	4510	205	190	176	164	154	145	137	130	123	117	112	107	103	98	95	88	82
24′-0″	4872	203	188	174	162	152	143	135	128	122	116	111	106	102	98	94	87	81
26′-0″	5250	202	186	173	162	152	143	135	128	121	115	110	105	101	97	93	87	81
28′-0″	5630	201	186	172	161	151	142	134	127	121	115	110	105	101	97	93	86	80
30′-0″	6060	202	186	173	162	152	143	135	128	121	115	110	105	101	97	93	87	81

INSTRUCTIONS FOR USE OF TABLES—

All loads are computed for the clear span.

Deduct width of beam flange to determine clear span.

Opposite the clear span in the first column, follow the table to the right until the proper figure for total dead and live load is reached. At the head of this column will be found the proper joist spacing.

HEATING AND VENTILATING FOR THE ARCHITECT

BY
PERRY WEST
CONSULTING HEATING AND VENTILATING ENGINEER

SOME feel that it is not necessary, in this age of highly specialized practice, for the architect to know very much about heating and ventilating. The architect finds, however, that there are a great many things which he must know about them in order to be successful in his own business. The problem is to differentiate between that which he does and does not need to know, so that he will not be burdened with any of the latter that can best be left to those who are especially trained and experienced in these particular branches of engineering.

The practice of architecture covers a broad and varied field, pertaining to art, science and business. The architect is generally the individual who pieces all of the various components of the building together, and it is he who must bring each of them into proper scale and keeping with the character, the cost and the purpose of any particular operation. In order to do this successfully he must have most accurate general knowledge about certain phases of each of these branches, but he is hardly expected to know all of the technical details, as a complete knowledge of any one is, at the present time, as much as anyone may hope to attain. Believing, therefore, that it is the part of wisdom for the architect to decide just what he should know about heating and ventilating, we shall endeavor to give an outline of the kind of information which may be considered most useful, and to name some of the reasons why and suggest some of the ways how this may be used.

Some of the Architect's Considerations

Residences. The kind of heating? Shall it be steam, hot water, warm air, gas, electric or some combination of these? If steam, shall it be one-pipe gravity, two-pipe gravity, closed or open, vapor or vacuum? If hot water, shall it be one-pipe, two-pipe, open or closed? If a warm air furnace, shall it be piped, pipeless, with or without a fan?

Office Buildings. Heating for the office or commercial type of building may be by any of the systems mentioned, and the points of particular interest to the architect are the same; but in addition he must know something about coördinating the heating and the hot water service; vacuum systems, forced circulation hot water systems, the relative merits of basement supply systems with up-feed risers, overhead supply systems with down-feed risers, balanced systems, and special automatic or manually controlled systems for meeting different outside weather conditions; divisions of systems into sections with controls for meeting the varying sunshine and wind conditions on the different sides of the building and separate systems for restaurants, assembly rooms, etc.

Hotels and Apartments. Heating in this class of buildings involves also the coördinating of the heating with the kitchen and laundry equipment, with electric or power plants, and with the refrigeration in certain instances. In hotels there is usually considerable ventilation also to be considered.

Hospitals and Institutions. In these structures there are usually added the problems of long transmission systems and summer heating for operating rooms, bathrooms, defective patients' rooms, etc.

Industrial Buildings. Heating these buildings involves the additional problems of space and light obstruction, coördination with ventilation and air conditioning and with the processes of manufacture.

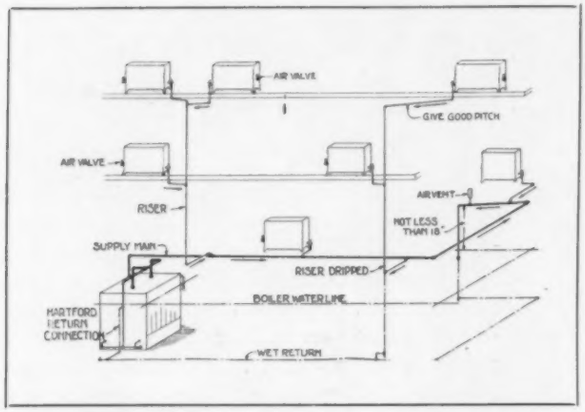
The Kind of Heating Apparatus

The kind of boiler to be used must be decided. Shall it be coal-, oil- or gas-fired? The kind of radiation must be chosen, whether the column type set on the floor; legless type hung on the walls; concealed in recesses or covered by cabinets; wall type; one of the newer types of concealed or cabinet radiators; or some of the latest tubular or radiant types. The problems of choice are often puzzling to the architect. Many are dependent on the owner's preference and on the proper relation of the heating system to the design and to the cost of the structure.

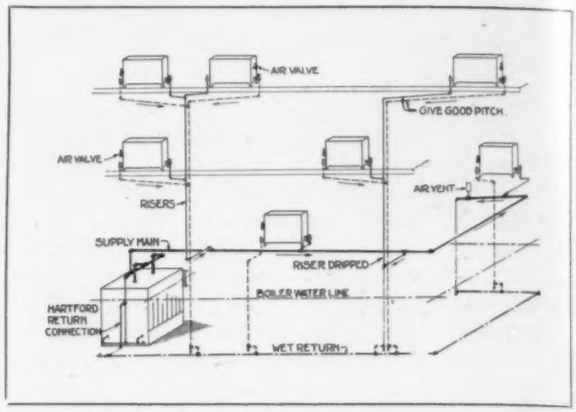
Ventilation. The architect desires to know under what circumstances ventilation is desirable or necessary; the type of ventilation to use; the kind of ventilation apparatus to use; the space requirements; the advantage of ventilation; the cost to install and operate ventilating apparatus; and how to go about securing the designing and operation of the system.

Answers to the Architect's Questions

Going back now to our list of considerations, we shall endeavor to give definite information, not expecting the architect to become an engineer, but in an endeavor to give such general information as may enable him to better visualize the kind of heating and ventilating apparatus best suited to the various kinds of buildings, so that he can discuss them with clients, have some idea of their relative merits and of the space, chimney, fuel storage and other such requirements, together with a better understanding of costs to install, costs to operate and the general results to be expected. We shall not attempt in this article to go into details, but to cover primary factors. The detailed standards to be employed, particular kinds of apparatus to be used, exact space and other building requirements and provisions, and human relationships will be more fully treated later.



Typical Gravity One Pipe Steam System



Typical Two Pipe Gravity Steam System

Heating Systems for Residences

Warm Air Furnace Systems. The pipeless warm air furnace is the cheapest to install, and for a small residence of not more than two stories, where all first floor rooms open off of a central room or hall and the upper rooms open off of the stair hall, it is very successful.

The piped warm air furnace is the next higher in price and may be made very successful for any residence, provided the apparatus and piping are of proper design and capacity. Warm air furnaces with fans are more positive in their performance, but they generally cost more than the others to install and to operate. Warm air furnaces are usually coal- or coke-fired, may be very successfully gas-fired, and are sometimes oil-fired. Oil-firing is rarely successful with old style cast iron, built-up warm air furnaces on account of the burning or warping of the furnace and the leakage of oily fumes and dirt into the rooms. The newer type of all-steel welded furnace does not present these difficulties. Warm air furnaces require on an average of from one to one-and-a-half tons of coal or coke per average sized room of residences per season in the colder climates of this country, which corresponds to from 25,000 to 35,000 cubic feet of 500 B.t.u. gas and from 140 to 210 gallons of furnace oil. Some recent developments in gas-fired, copper-tube, fan, warm air heaters seem to have materially increased this efficiency, so that the consumption of gas may run as low as 20,000 cubic feet per room per season. Warm air furnaces have these advantages:

(a) Low first cost.
(b) Combining heating with ventilating.
(c) Quick response; heating rooms rapidly.
(d) Absence of unsightly, inconvenient radiators.
(e) Absence of escaping steam or air from air valves in the room.
(f) Humidity as well as heat, in best types.

They also have certain disadvantages:

(a) Lack of uniformity in the distribution of heat, due to the action of the wind, or other weather conditions against any particular room or side of the house. Such conditions may retard the flow of warm air from the furnace to the particular rooms by preventing the outward leakage through the cracks of windows and doors, or by unduly chilling certain walls so that the warm air cannot properly overcome this chilling effect, especially during heating up periods.

(b) Leaks between the fire pot and the heated air chambers in the old style cast iron, causing fuel gas and dust to pass to the rooms being heated.

(c) Susceptibility of the fire pot to warping, cracking and the opening of joints, due to the uneven and sometimes excessive temperature, resulting in increased leakage of gas and dust into the rooms.

(d) Rapid deterioration of the furnace, due to the overheating with air only, with no water on the outside of the fire pot surfaces.

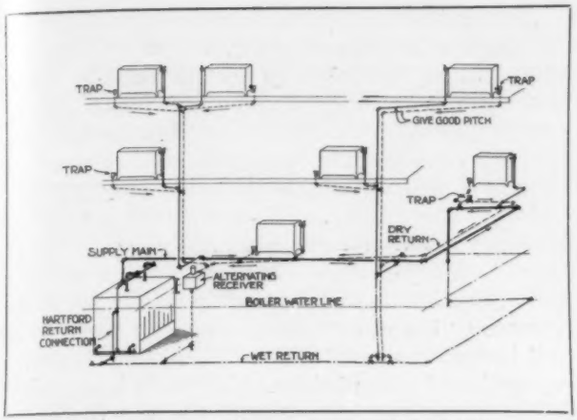
(e) Difficulty of changing or extending the system to accommodate additional rooms.

(f) Low relative humidity and drying effect of the heated air, especially in close proximity to the warm air inlets.

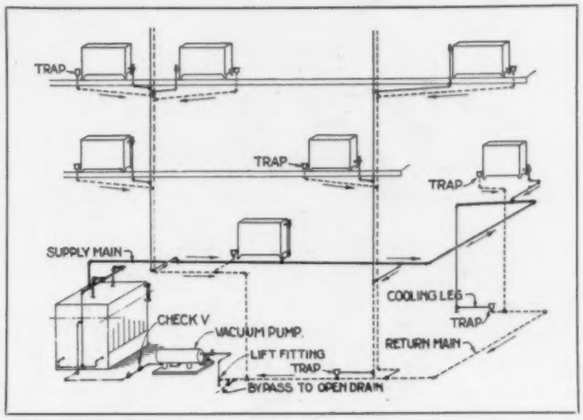
It should be noted that most of the difficulties under (a) may be eliminated by proper design and the use of indoor recirculation or fan-equipped heaters. Also that most of the difficulties under (b), (c) and (d) have been eliminated in some of the latest and best designed types of heaters.

For general data as to building, chimney and wall stack requirements, it is well to refer to pages 207, 208, 211, 212, 216 and 217, of the American Society of Heating & Ventilating Engineers' Guide, 1928. Warm air heating should conform with the Standard Code of the National Warm Air Heating and Ventilating Association, Cleveland.

Steam Heating Systems. The one-pipe gravity steam system is the next higher in first cost to the warm air furnace and is the cheapest and simplest type of steam heating system to install. Its operation is very satisfactory when it is properly designed and installed, but it is susceptible to many difficulties of poor circulation and noisy operation due to the steam's flowing *to* and the condensate *from* the



Typical Gravity Vapor System With Receiver



Typical Installation Using Vacuum Pump

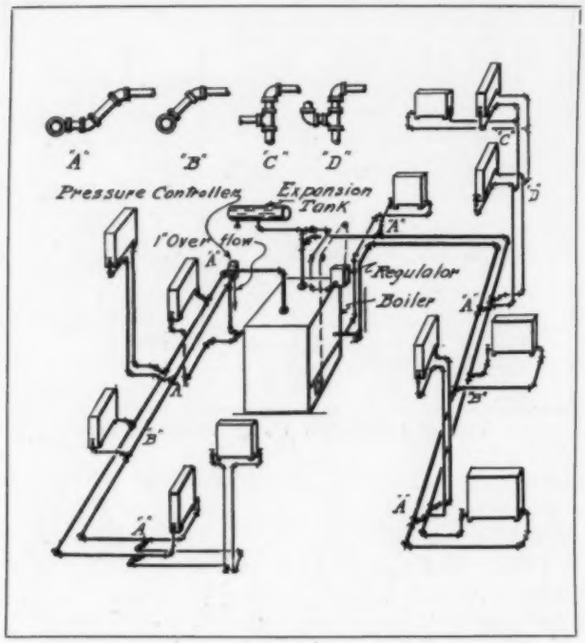
radiators through the same pipes. Air valves must be used on radiators and mains with this system, and they may give trouble and annoyance from leakage of steam and water and the discharge of odoriferous air into the rooms. This system is not adaptable to fractional control of heat and must be run with the radiator supply valves either wide open or tightly closed to prevent the retention of water and consequent noise due to intermittent flow of water and steam, which occurs when a valve is partly open. It is also slow to respond to irregularities in the steam supply, since the system tends to fill with air every time the steam drops below atmospheric pressure, and much time is lost in expelling this air through the small air valve ports as the steam is again raised. Some relief can be had from this difficulty by using a non-return type of air valve on radiators and mains.

Two-pipe gravity systems circulate more freely, but are susceptible to the backing up of steam through the returns from one radiator to another unless each return is connected separately to the return mains below the water line, which greatly increases the cost and multiplicity of pipes. Air valves must be used with this system, and it is susceptible to all of the difficulties of the one-pipe system not covered here, and is fast going out of use. Non-return air valves cannot be successfully used where the returns are connected below the water line.

Vapor systems are the latest of two-pipe gravity steam systems and are generally the most satisfactory steam heating systems for residence work. They differ from the gravity two-pipe systems in four important particulars: (1) by means of thermostatic or other forms of automatic traps on the return ends of all radiators the steam is prevented from entering and building up pressure in the return systems; (2) the air is eliminated from the radiator with the condensation through the radiator returns into the return system and thence to the atmosphere through automatic vent valves or other forms of automatic air-venting apparatus near the boiler instead of through individual air valves on the radiators in the rooms; (3) the backing up of water in returns may be prevented by the carrying of exceedingly low supply pressures; (4) real fractional control of the amount of heat is possible. In vapor systems, boiler protection is given by devices supplementing the damper regulator and may be in the form of an alternating receiver, return trap, equalizing or differential unit. An approved return connection is quite extensively used in place of a check valve for partially preventing water from leaving the boiler. Vapor systems usually are provided with vacuum venting valves at the boilers, which prevent air from returning through the vent ports, thus permitting the formation of a partial vacuum when the generation of steam pressure above atmospheric ceases. The cost of a vapor system is from 10 to 20 per cent more than the cost of a one-pipe system.

Vacuum return-line systems are not used in residence work except for unusually large houses. They are similar to vapor systems in every way, except that a pump is used to produce a vacuum in the return system by removing air and water. They permit wider variation in pressure differences between steam and return mains. They are installed in buildings where it is required to operate at low initial pressures or where, by reason of the layout, radiators must be located below the water line of the boiler. This type of system is also well adapted to large groups of widely separated buildings. It is generally used where exhaust steam is available, as it can be operated on a low back pressure without appreciably decreasing the capacity or economy of steam engines. A vacuum pump is used to accelerate circulation by discharging both water and air, the water being returned to the boiler and the air vented to the atmosphere. Because of the greater pressure differential of vacuum systems, the result of faulty grading of piping connections is less serious than in the other systems mentioned, and the returns can be smaller. Refer to American Society of Heating and Ventilating Engineers' 1928 Guide, page 86, for diagram of this system.

Hot Water Heating Systems. Hot water systems are generally the most satisfactory and economical for residences where the operation is continuous and when it is not intended to leave the system without



Closed Hot Water Heating System, Showing Connections

attention for long periods during cold weather, when the water might freeze. They are slow to respond to irregularities in the condition of the fire or to compensate for sudden changes in weather conditions. They are very adaptable to either hand or automatic temperature control, and with automatic control and continuous operation give little or no difficulty on account of slow response or in compensating for varying weather conditions. Gravity hot water systems are susceptible to difficulties arising from faulty design or workmanship, since the motive power for circulation is very small and the flow currents are easily diverted or short circuited. Forced circulation systems are positive, but they are generally too costly to install and operate for residence work. The one-pipe gravity hot water system is the cheapest to install, but is not much used because of its comparative sluggish and uncertain operation. The two-pipe system costs about the same to install as a vapor steam system and should show some saving in fuel. One-pipe systems are somewhat cheaper, as they require no special accessories, but they do require larger pipes and more radiation than the closed systems. They are also limited to a water temperature of about 180° Fahr., and are therefore not so flexible in capacity or control. The closed type may have the tank in the basement or be of the pressure-reducing valve and relief valve type of system, and is perhaps the best type of hot water heating for residences.

Gas heating may be used in the form of gas space-heaters or gas-steam radiators as auxiliaries for breakfast rooms, bathrooms or other special rooms where heat is required when the regular system is not in operation, or for early morning heating. Gas may also be used for gas-fired boilers or furnaces.

Electric heating at present is usually too expensive for general residence heating, but it may be employed as an auxiliary. In certain locations where water-power electricity is cheap and fuel is high in cost, it may well be used. Electric heating with current at 5 cents per k.w. hour is about 15 times as expensive as steam heating with coal at $15 per ton.

Hot Water Service. This service for a residence is usually a comparatively small load and can be combined with any of the systems mentioned by a copper coil or cast iron heating element in the fire pot of the furnace or hot water boiler, or by iron shell copper coil heaters connected in local circulation below the water line of steam boilers. Care must be exercised in placing coils or other heating elements in the fire pot to keep them out of the way of firing or the cleaning of grates, so as not to interfere with the efficiency of the boiler or furnace. The heating of water in summer is usually taken care of by gas-, oil- or coal-fired heaters connected in parallel with the winter heaters.

Office Building Heating. The hot water requirement of office and other commercial buildings is generally an appreciable load and is usually taken care of by a separate boiler or heater. If exhaust steam is available, a separate steam heater may be used; otherwise a separate steam boiler with a tank coil heater attached, or a coal-burning heater or combined refuse burner and water heater may be used. Care should be taken to have a heater capable of withstanding the water pressure in tall buildings. Forced circulation hot water is a most satisfactory and economical system for this class of building, but it costs more to install and must be arranged so that there will not be excessive static pressure on the radiators. The obstruction and unsightliness of basement supply mains can be avoided if space is available for overhead mains above the top story. Overhead mains allow the use of smaller down-feed "risers," produce better circulation, and by running the returns in trenches in the basement, all exposed piping may be done away with. By dividing the system into sections corresponding to the varying requirements for heating due to changes in the sunshine, wind and exposures on the various sides or wings of a building, either automatic or hand control may be applied for equalizing the heat so as to save fuel and prevent overheating. By the application of some form of automatic vacuum or pressure control and balancing features, the heating may be kept in step with variations in the outside temperatures.

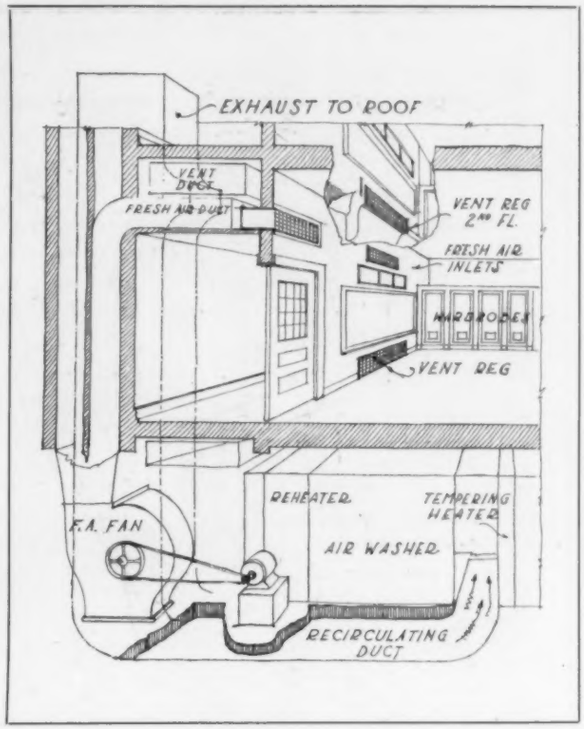
Hotel and Apartment House Heating. The domestic hot water requirements are relatively heavy in these types of buildings, and frequently run as high as 25 per cent of the total heating load. It is not generally advisable to heat this volume of water with coils or surfaces either in the fire box or in the water circulation of the house heaters. If the water heating is to be done from the house heaters, these should be divided into units so that one or more may be used on this service alone in the summer, when other

heating is not required, without being too large and therefore uneconomical for operation on this load.

In hotels where kitchen equipment is to be supplied with steam at about 30 pounds pressure, or laundry equipment at about 80 pounds pressure, it is general practice to generate all steam at about 100 pounds pressure and supply the heating system, the domestic water heaters, the kitchen equipment and the laundry equipment through separate pressure-reducing valves set for the respective purposes. Where refrigerating apparatus is employed, it will generally be found that the steam required to operate this will produce exhaust about sufficient to heat the domestic hot water. A very economical arrangement is to have steam-driven refrigerating units with tank heaters using this exhaust steam for heating water. Care must be exercised to have the hot water storage tanks of ample capacity, as the refrigeration load is practically constant while the hot water demand fluctuates from 10 to 300 per cent of the average hourly load, and unless the storage tanks have a capacity of from one and one-half to twice the maximum hourly demand, much of the exhaust may be wasted, especially in the summer months. Separate water heating apparatus consisting of tank heaters connected directly to storage tanks by means of local water circulating pipes, or of steam or water boilers connected to coil tank heaters, are sometimes used, but it is generally found best to do all of the heating from one central boiler plant.

Hotel and apartment house ventilation is generally employed in kitchens and public toilets; frequently in dining rooms, ball rooms, assembly rooms, public spaces, laundries, boiler rooms, engine rooms, store rooms, and all interior bathrooms. Exhaust ventilation without fresh air supply from other than adjacent spaces is sometimes employed for kitchens, toilets, laundries, boiler rooms, engine rooms, store rooms, and interior bathrooms, but care must be exercised, in using exhaust ventilation alone, to prevent disagreeable drafts through doors and other openings, to prevent interference with the draft in the boiler room, and to prevent interference with proper heating due to the increased inleakage of cold air from the outside. A properly heated or cooled, cleaned and moistened supply of fresh air should be used in conjunction with exhaust ventilation for dining rooms, ball rooms, assembly rooms, public spaces, boiler rooms and all other spaces where the supply cannot be properly taken care of from adjacent rooms. This requires heating in winter and, for the better classes of ventilating, cooling in summer. The heating of air for ventilation in colder climates requires from 3 to 5 tons of coal per season, per 1000 cubic feet of air per minute delivered; cost of power is from $25 to $40 for that amount of air.

The cost to install good ventilation may range from 1 to 3 per cent of the cost of the building, depending upon the relative amount of space to be ventilated. The cost to operate can be very materially reduced where a generating plant is used, from



Central Fan Split System for School Use

which the power and exhaust steam may be taken, or where recirculation is employed, and in many such cases it may be reduced to practically no additional cost for the operation of the best kind of ventilation. In many localities the ventilation of interior toilets is compulsory under certain laws prescribing gravity or mechanical systems.

School and Public Building Heating. School heating is either by gravity warm air furnace, fan furnace, steam or hot water, and is usually combined with some form of ventilation. In furnace installations the ventilation is an integral part of the system. In steam or hot water installations, the heating may be by direct radiation with either a central fan system, individual ventilating units or a gravity system for ventilation, or by a combination system of heating and ventilating using a central fan or units. Steam or hot water with direct radiation in the rooms and fans or units for ventilation is a generally accepted standard for colder climates, while the combination system of heating and ventilating with warm air by central fans or units is employed for milder climates. The former is commonly known as the "split" system, while the latter is termed the "hot blast" system. The hot blast system is simpler and cheaper, but it requires the delivery of the air in cold climates at from 15 to 25 degrees Fahr. above the temperature of the room, with consequent excessive dryness of this air before it is cooled to room temperature. In the absence of any direct radiation, the chilling effect of exposed walls is hard to overcome with warm air alone, so that in some cases the temperature adjacent to these walls will remain quite low for con-

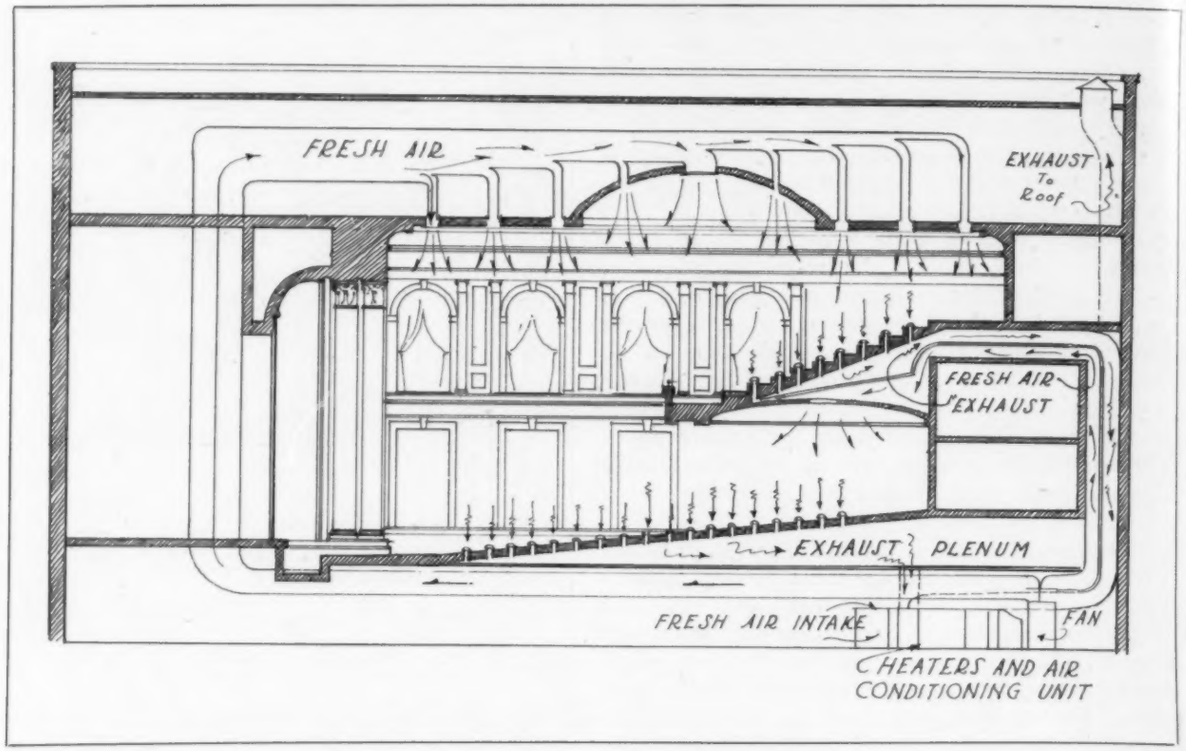


Fig. A. Downward System of Ventilation for Theaters

siderable periods in the mornings in cold weather.

Steam or hot water systems with direct radiation in the rooms may employ gravity ventilation either in the form of fresh air supply ducts, with warming stacks at their bases and exhaust flues running to ventilators above the roofs, or the fresh air may be taken in through the windows and be exhausted in the same way. These systems are not positive or under control in their action, and are subject to all of the vagaries of wind and weather conditions. The former is one of the old and practically obsolete forms of schoolhouse ventilation, while the latter though much older is one of the latest to be advocated by some and as thoroughly condemned by others. These systems conform to no particular standard, produce no definite results, and save nothing either in the cost to install or to operate. Upon first thought it would appear that the so-called open window system would require less space and cost less than almost any other system, but when thoroughly analyzed, and if installed in accordance with the requirements laid down by those who have experimented with it most, it not only costs more to install but requires a greater building cost and greatly increases the costs not only to operate the heating and ventilating system but for the general school administration as well, and there is decreased pupil capacity.

Recently several schemes have been suggested for supplying unheated or very slightly tempered air, by mechanical means, through a narrow opening all along the window stools of classrooms to take the place of the natural air supply through the open window, and for dividing the radiators under windows into two or more horizontal sections for better temperature control. The June, 1926 and March, 1928 A. S. H. V. E. *Journals* give descriptions of these suggestions. Unit systems generally employ vertical gravity exhaust ducts running up from each room to ventilators above the roofs, but the exhaust may be into corridors, thence through ducts to the roof or into horizontal ducts furred down over corridors and thence into main vertical ducts discharging above the roofs. Where vertical ducts in the rooms are eliminated, this system requires the least space of any. The piping system to and from the units and the electric supply to unit motors are increased over the requirements for central systems.

The central fan system may employ vertical supply and exhaust ducts for each room, or the supply and exhaust ducts or either may be furred down over corridors and connect into main vertical ducts to eliminate all vertical ducts in rooms. There can be fan supply and gravity exhaust, gravity supply and fan exhaust, fan supply and fan exhaust or one fan for supply and partial exhaust recirculation with gravity exhaust relief for the portion of the air not recirculated. This latter system, when properly designed, is one of the cheapest to install and to operate and can be controlled to uniformly give any results desired. An accompanying diagram illustrates a central fan, split system, where both the fresh air and vent ducts are furred down over the corridor ceilings and where one fan is used with partial recirculation. The fan and other apparatus

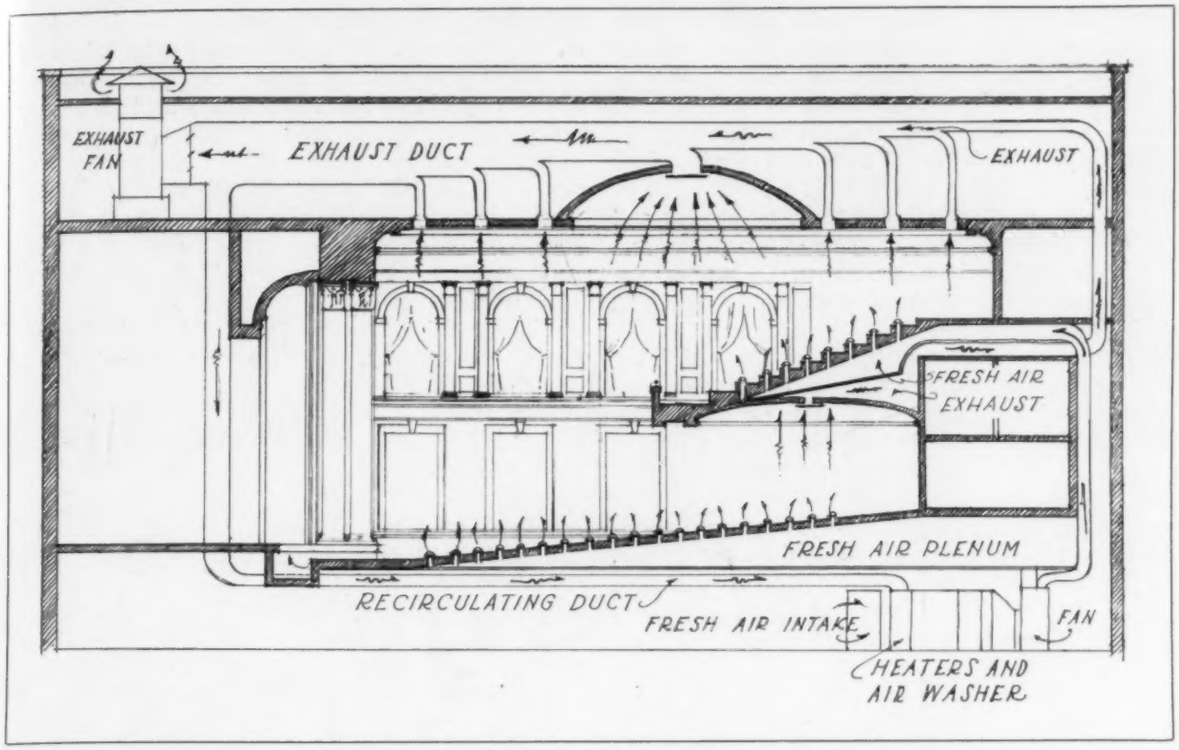


Fig. B. Upward System of Ventilation for Theaters

may be placed in a pent house on the roof in this type of system, instead of as shown, thus eliminating these and the large piping in the basement. In any of these systems ventilating units may be used to take the place of the supply fans, heaters, air washers, and air filters, in which case the fresh air ducts are also eliminated; but the piping must be increased to take care of the steam and returns to the units. The removal of foul air from the rooms may be either by gravity vents or by means of exhaust fans.

The opinions and convictions of the school authorities, especially of those who are to use and operate the apparatus, should always be given due consideration in connection with the heating and ventilating of any school building. There is a deepseated conviction in the minds of some school people at the present time that the apparatus should be controlled by the teachers and not by the janitor. Some principals and teachers support this idea and assume its responsibilities and, where they cannot be convinced to the contrary, it is my experience that they are better pleased with the results produced under their own control than they would be with any results the janitor could deliver, even with the best apparatus and automatic control. This idea has done more perhaps than any other one thing to popularize unit and open window ventilation, and while these methods have such advantages as making it possible to do away with the fresh air distribution systems and otherwise simplify the installation work so that more of the apparatus can be fabricated in responsible factories instead of on the site by less skilled contractors, they have disadvantages such as not being susceptible to as satisfactory an arrangement for air cleaning, humidifying and other proper conditioning and control as has the central system. It is also a fact that a properly designed central system arranged for automatic control and partial recirculation can usually be operated more economically than most other systems producing equal results.

The proper care and operation of any system is a most important factor, and for this reason those who are to use and operate the particular system must have confidence and interest in it; otherwise it is doomed to failure from the start. In all public schoolhouse heating and ventilating, the requirements of the local laws must be complied with. These laws generally provide that the heating apparatus shall be capable of heating to 70° Fahr. inside with an outside temperature of 0° Fahr., and that the ventilating apparatus shall be capable of supplying not less than 30 cubic feet of properly heated fresh air per minute per pupil, in all classrooms. Assembly rooms, gymnasiums, social service rooms, cafeterias and such other spaces as are used at times when other parts of the building are not in use, should have separately controlled heating and ventilating systems. School toilets should be ventilated independently of the remainder of the building.

Public Buildings. Other public buildings present various problems, but are generally heated with steam or hot water and ventilated by one of the methods referred to here. Assembly halls, court rooms, large work rooms, public toilets, engine

rooms, boiler rooms and store rooms are usually ventilated. Good exhaust ventilation of ample capacity proves very satisfactory, except for theaters and public auditoriums where both fresh air and exhaust should be used with arrangements for cooling and dehumidifying in the better class of well patronized theaters. The problem in these is generally that of cooling and ventilating rather than of heating and ventilation, even in winter. This is due to the fact that in this class of building, where exposure is relatively small and the heat given off by the audience, and by the lighting and the power equipment is relatively large, the amount of heat thus liberated in the building is greater than that lost to the outside.

Downward ventilation with fresh air and partial recirculation admitted through numerous grilles at the ceilings and exhausted through numerous mushrooms under the seats, is the best system for this type of building, provided refrigeration and dehumidifying apparatus are provided for summer use, but the upward system with fresh air admitted through numerous mushrooms under the seats and exhausted through grilles in the ceilings, and especially under and over galleries, is better if cooling and dehumidification are not used. With the downward system and cooling, smaller fans and ducts may be used, and an average of about 8 cubic feet of fresh air with 24 cubic feet of total air circulated per person per minute may be used, while from 30 to 75 cubic feet per minute per person is required with the upward system and no cooling. Fig. A illustrates a downward system of theater ventilation, while Fig. B illustrates an upward system. Smaller auditoriums may be ventilated very successfully by separate units or by central fan systems delivering air on each side of, or over the proscenium arch,—or sometimes from the rear toward the stage, with either gravity or fan exhaust from near the floor in front of the stage and through the ceiling under and over the galleries. It is always preferable to have the flow of air from the stage toward the audience as an aid to acoustics. Such systems should handle about 30 cubic feet of air per person per minute, and may be partially recirculating. They are very much less expensive than the more elaborate systems.

Hospital and Institutional Heating. Hot water is one of the most satisfactory and economical systems to operate for this type of heating, but because the boiler plant is usually located at some distance from the buildings, long and large transmission systems with forced circulation and a considerable amount of water heating equipment are required, which increases the first cost to from 15 to 20 per cent above that for a steam system. Cost of equipment may be reduced by employing direct-fired hot water heaters or boilers, but inasmuch as steam is required throughout for kitchen, laundry, sterilizers, warmers, etc., steam boilers are also required, which in turn increase the number and cost of "stand-by" units and prevents the alternate use of the boilers on either system. In some hospitals the height of the building would cause excessive static pressure, and in any case a hot water leak would be a very serious matter in this kind of building. Space requirements are also increased, so that in many hospitals and institutions steam is the heating medium used. Direct radiation is usually employed and should be of an open type easily cleaned and hung on the walls 6 to 8 inches above the floor, 2½ inches from finished walls and with supply and return connections running from walls instead of up through floors. Air supply is sometimes provided either back of or over the radiators for ventilation.

Radiators in operating rooms should be set back of a shield (usually of glass) with access doors and grilles for circulating the heated air to the room. The domestic hot water requirements are much the same as for hotels, and the coördination of this with the heating and refrigeration may be treated in the same way. Operating rooms, bathrooms, examination rooms, defective patients' rooms, etc., often require heat in the summer and should be equipped with auxiliary radiation fed from the high-pressure steam system through pressure-reducing valves and returning separately or through the high-pressure returns to the boiler plant. Ventilation should be employed in sink rooms, food service rooms, wards, corridors, laboratories and nurses' stations, in operating rooms when desired, and in other parts as was recommended for hotels. Private rooms may be ventilated, but present custom is to rely on windows with some good type of ventilation sash, window deflectors or special window intakes with enough radiation under windows to compensate for the incoming air. Ventilation elsewhere usually requires only exhaust fans, but where clean air cannot be taken in through windows, supply systems should also be used with air cleaners and washers.

Industrial Heating. Industrial heating may be by direct radiation, but this is fast giving way to unit heating, especially for rooms with high ceilings, as units are cheaper to install, cost less to operate and obstruct less of the side wall and window space. Unit heating and air conditioning apparatus is available. Central fan-blast systems are also used and are advantageous where air conditioning is required, as the control and distribution can usually be well worked out. Overhead ducts are sometimes undesirable as they obstruct light, but at other times "units" are sometimes undesirable, as they may constitute a floor or overhead obstruction.

The illustrations on pages 592, 593 and 594 are from the A. S. H. & V. E. Guide.

Editor's Note. Mr. Perry West's next article will continue the consideration of Heating and Ventilating for the Architect, taking up the theoretical and practical standards of heating, ventilating and air conditioning for various types of buildings.

RAMP PROBLEMS IN GARAGES

BY

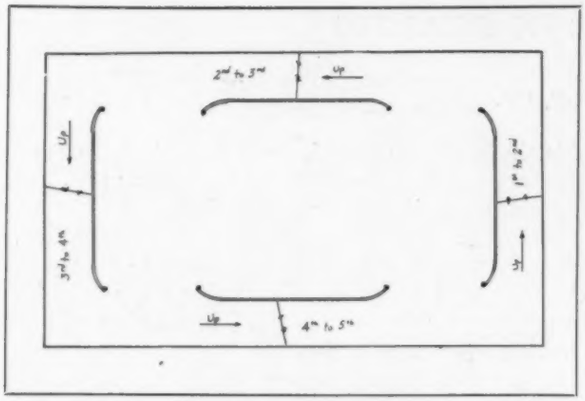
K. F. JACKSON, C.E.

HAD one stood for say two minutes just before nine in the morning, and again during mid-afternoon at a prominent intersection of streets in any American city a dozen years ago, and should he repeat the experience today, he would immediately appreciate the *raison d'etre* of the large metropolitan garage. I am doubtful whether he would require the two minutes. A glance would almost be sufficient for him to make three observations,—he would surely be impressed by the large and increasing number of business people who are "commuting" by automobile; by the many cars which are bringing the great army of shoppers to the stores; and finally by the vast number of cars and trucks of every description, which are employed in the transaction of modern business. Given these conditions, the inevitable result is two-fold: a dearth of space for standing vehicles in the streets and squares during daylight hours, reflected in ever more stringent parking regulations, and a tremendous need of housing accommodations for fleets of trucks at night. Thus there has been created a distinct construction necessity which is engaging the attention of promoters and builders, and through them, of capital,—namely, the city garage.

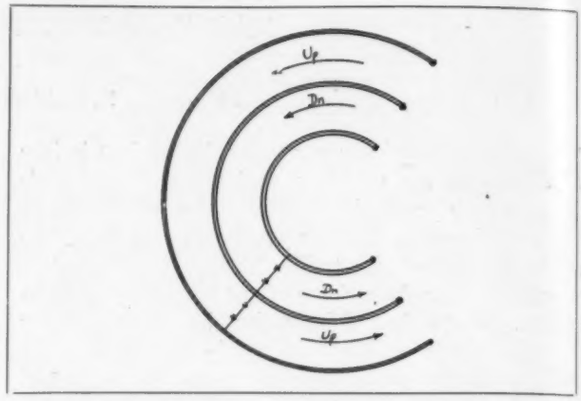
For several reasons these buildings must all take the same general form. The high value of property within city limits necessitates a large amount of floor space in proportion to the area of ground covered, which means that they must be multi-storied. Similarly, economy of operation, requiring a small staff for management, allows but a minimum number of entrances and exits. These features, together with other limitations as to size and speed, render elevators impracticable and make imperative some system of ramps from street level to top floor. Before taking up consideration of the various types of ramps which have been evolved and applied, it might be well to note certain typical requirements to be met in all city garages, for the more perfectly and completely met, the more successful the garage as a business venture. Since the primary requisite of any building erected on a commercial basis is that it shall yield at least the usual return on the capital invested, those financially interested are concerned with a few of the broader, more comprehensive essentials. First among these is the location, upon which depend several important considerations. Are its potentialities sufficient, provided the business can be secured? Are the expected patrons likely to use the garage facilities if presented to them? What about competition, present and future? Is the district over-garaged? Is it likely to be? All of the foregoing is in fact beyond the scope of this writing, and is touched upon here merely for the sake of completeness. Henceforth it will be assumed that a suitable site has been selected, that a client is desirous of building, and that the financing is available provided a profitable undertaking appears likely.

Of large significance is economical operation, which in turn hinges on several points to a varying extent, yet all deserving of intensive study in order to produce the desired result. These points will be covered subsequently in detail. Summarized, they are: (1) minimum personnel for management, (2) rapid movement of car traffic, (3) provision for efficient classification, and (4) maximum accessibility of cars. Another aim of scarcely less importance is to so arrange plans as to derive the best use of the allotted floor space; the maximum parking capacity must be realized. This is a broad statement, however, and should be amplified. The reaction of the patron to the entire plant is paramount. A 500-car capacity garage which, on account of its physical characteristics, can only maintain a steady patronage of 300 is much less to be desired than a 400-capacity building so attractive in its appointments that it can command 350, except under extraordinary circumstances of weather or whatnot. The number of vehicles accommodated and actually yielding revenue determines the soundness of the investment. Lastly in this category of considerations is convertibility. All cities are to a certain extent mobile. The character of a locality is subject to change. Business is not sufficiently stabilized to maintain centers, and this shifting process may so alter conditions that the garage building must be adapted to new uses. This is a matter of perspective, however. The true purpose of the project should not be eclipsed by a lesser possibility considered too closely. A garage is to be built, and the most efficient arrangement for such should be accorded greater weight than remote futurities. Yet some exercise of thought is needed, and if a strong doubt exists as to the continued fitness of a site for garage purposes, it would be better to select another site.

An analysis based on these considerations will, as already said, fix the status of the projected garage,—whether or not it is likely to be successful. The succeeding elements will determine to a large extent the degree of success which may be attained. In a garage such as has been outlined, of several motors and probably with a single entrance and exit, one of the important problems for solution is that of securing rapid movement of cars. This is particularly the case in an establishment catering to drivers who leave their cars in the morning and remove them in the evening. All arrive and all leave at approximately the same hours, which creates twice daily peak conditions. Nothing is more annoying to the average motorist than to be held stationary with motor running, breathing exhaust fumes with in-



Straight Run Ramps; No Sharp Turns; Good Visibility



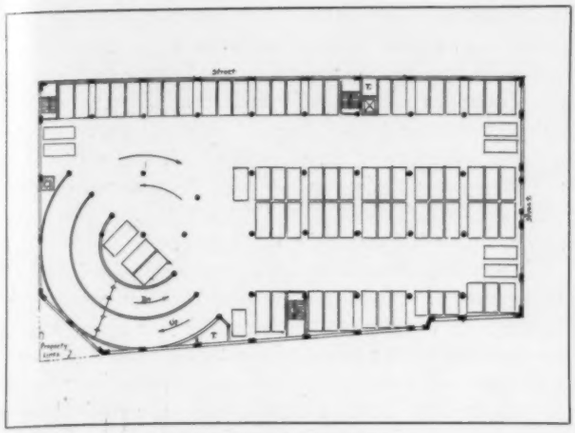
Ingenious Variation of Spiral Ramp; Outside Spiral Up; Inside Spiral Down

creasing impatience. It does not require many experiences of this sort to effect a change in patronage. The next time he will park his car somewhere else.

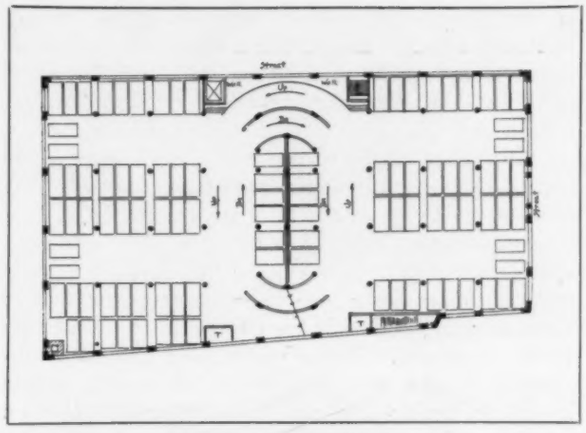
Obviously the fast movement so necessary can be accomplished by eliminating all causes of delays, notably by facilitating entrance and exit with level or nearly level driveways, with no blind corners; by affording ample magazine space, that is to say, a sufficiently long run on the ground floor to permit of classification of a car at entrance and checking off at exit without actually stopping the car; by an easily negotiated ramp, about which more will be said later; and by arranging the parking off the traffic lanes. A certain amount of jockeying to get in or out of a stall cannot be avoided, but this maneuvering should not interfere with other cars. To accomplish this, there will necessarily be sacrificed some floor space, which is utilized for subsidiary parking aisles leading away from the main driving aisles. It will be found well worth while, nevertheless, to get rid of any clogging moving traffic from this cause. It should be noted in the typical floor plans reproduced a little further on that due attention has been accorded all these points. The start of the ramp is placed at a comfortable distance from the street entrance, thus allowing for proper classification of entering vehicles, and similarly for checking them out. Likewise, virtually all car stalls are facing on parking aisles. The necessity of having maximum parking space comes next after these. Cars should be readily accessible to avoid delay to drivers. Much time and effort can be expended needlessly in moving one or more cars to release another. Some cars are known quantities in respect to the time they will be called for, and consequently may be blocked temporarily, but for the most part, cars must be free to be moved at any and all times. The sketches included here illustrate this point also. Above all, it should be possible for any driver to ascend the ramp and maneuver his own car. A ramp which requires the services of an experienced attendant is a liability and will never wear out from use. Another refinement too frequently forgotten is the minimizing of the amount of walking which must be done to and from the car stall to the stair or elevator, and the provision of a place to walk without dodging between moving cars and having a slowing effect upon them. Every stall cannot be adjacent to a means of ascent and descent, but no stall need be very far away, and the majority can be comfortably near.

Turning now to a contemplation of the features for which to strive in the ramps themselves, it is quite natural to find them dovetailing to a large extent with the previously mentioned requirements applicable to garages in general. All of the advantages to be enumerated here cannot be obtained, inasmuch as some are in opposition to others. They will be commented upon separately for clearness, and it is to be realized that in any particular garage, all are worthy of consideration, and where conflict exists, the conditions pertaining must determine their relative merits. In most cases, a nice adjustment is the solution, and a compromise giving the best ultimate result will have to be worked out. Insofar as possible, a ramp should have an easy and not too varied percentage of grade, ample turning radius for the largest cars, width enough for comfortable driving, and good visibility. The reasons are apparent. All contribute to the speed of traffic, to the satisfaction of patrons, to minimum wear and tear on cars, and hence to economical operation and increased patronage, the two greatest virtues of any garage. These various points will enter the later examination of the types of ramps and what advantages each offers.

Some additional thought should be devoted to reducing the amount of valuable space sacrificed to the ramp, and also to the ramp's flexibility. By this is meant the quality which will permit of varying story heights without resulting in too steep grades or too great variations in grades. It is frequently advantageous to plan a garage for the accommodation of trucks on the lower floors and passenger cars above. The trucks will require somewhat more headroom, yet the arrangement of the ramps would preferably be typical in the several runs. Otherwise, drivers will become confused and cautious, with a general



Circular Spiral Ramp



Elliptical Spiral Ramp

slowing down of traffic resulting. Sudden changes of grade will produce a like effect, and must accordingly be guarded against. A ramp with a low grade is the only kind which can satisfactorily meet this condition, and such a ramp, unless ingeniously planned, will be prodigal of space occupied. There is a way to avoid this disadvantage, as will be shown. The cost of constructing the ramp is also of some moment, though it can scarcely be called important except in the case of a small structure. A fairly safe rule to adopt is this,—select the type of ramp which will satisfy the conditions and afford the greatest number of physical advantages, and its cost will be taken care of in the service rendered.

Ramps at their worst are not exceedingly difficult of erection, although the work requires a skilled and experienced building superintendent. Some are more difficult than others,—much more,—and all should have better than ordinary attention. The most involved part of the work is completed with the construction of the forms. Excellent ramps have been and will continue to be built. A little more perplexing than in the usual construction is the placing of the reinforcement, yet similar problems are encountered every day in variously pitched roofs. Needless to say, a little extra care in mixing and pouring the concrete is desirable. This is merely to offset the human equation, to compensate for the slightly greater chance of a flaw in the work due to its complicated nature.

There is a further item of cost in connection with ramps which must be noted, and the reference is made to royalties. Many patents have been taken out on ramp systems and ramp features, the large majority of which mean little or nothing. Some there are, on the contrary, seemingly good and functioning. In the interests of impartiality, none of the names will be used here, since the writer might inadvertently neglect to mention some deserving type. The justification of patenting such a thing as a ramp system might appear, at first blush, questionable. The fact remains that such patents do exist, and when it is realized that they represent a tremendous amount of time and experimenting, as well as the expenditure of much money, one finds scant excuse for protest. Furthermore, their sponsors offer the results of their experience in advice and service, and there is no doubt but that their use results in savings which far outweigh the patent fees. Ramp royalties are generally figured on the base price of 10 cents per square foot of the entire area, and with a sliding scale of discounts depending upon the size of the building. The price of the royalty for a ramp for a garage with a capacity for 500 cars would be say $10,000.

The several forms of ramps may be now enumerated and the characteristics peculiar to each presented and discussed. Beginning with the simplest, there is the plain, ordinary incline, a straight run from one level to the next, obviously excellent when circumstances make its use feasible. It requires either a very large or very long building, since upwards of 80 feet in horizontal projection is necessary to rise the normal story height without excessive grade. Such a combination of conditions is rarely found, although in passing, there might be mentioned the Motor Mart Garage in Boston, said to be the largest in the world, where ramps of this kind are employed. In this instance the ramps are laid out in such a way that the travel of cars is around the building, succeeding ramps being located on succeeding sides. This arrangement proves very effective, since the driving is made easy, there are no sharp turns, and visibility is good. All parking is away from traffic, and hence there is little chance for delays. The capacity requirement is likewise well met.

The most common type of ramp found in present-day city garages of more than three stories is the curved or spiral type. This classification may in turn be sub-divided into those which are circular in plan, and those approximately elliptical. Both are applicable to the ordinary lot, the shape of which is of no consequence. Commenting on the circular spiral, the outstanding merits are easily summarized. It occupies the least amount of space, thus contributing to one of the principal aims,—maximum capacity. For the same reason, it caters to the feature of

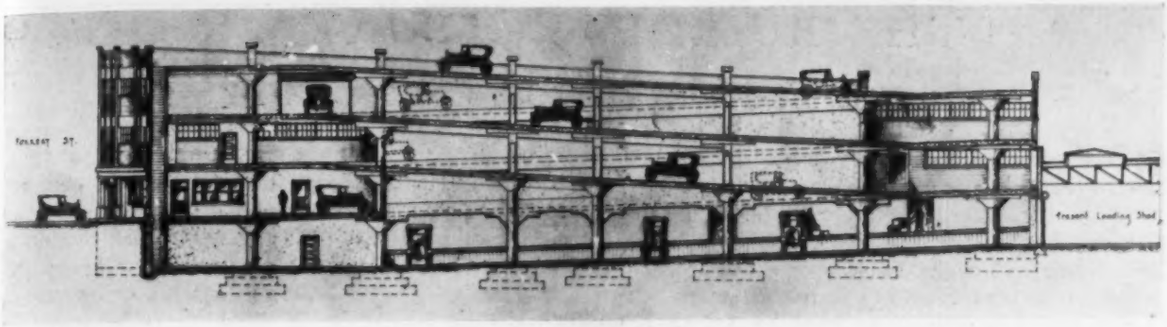
convertibility, inasmuch as the building can readily be adapted to a different use with minimum loss of floor space; or, if alterations are made, small amount of demolition and replacement is necessary. Further, because of the shape and small space necessary, a circular ramp can be tucked into a semi-useless corner or jog. The disadvantages of this kind of ramp are that it is one of the most difficult to build, and hence costly; it is likely to be reduced in size with sharp turning and steep slopes; the visibility is very poor, a driver being able to see only a few feet in front of him; and it is hard to negotiate, especially with a long car. These undesirable characteristics slow up traffic with consequent bad effect, induce strain on the drivers, and cause wear and tear on the cars. At present some modification of this type is most generally in use, and there are doubtless examples of it in almost every city which boasts a large garage. A typical layout for a circular spiral ramp is shown in one of these diagrams. Before completing consideration of ramps of circular plan, mention should be made of an ingenious variation wherein one spiral is within another. The inner spiral is for down traffic, the outer for that moving up. Yet all traffic is traveling in the same direction. The interesting point to be noted is the clever method by which the meeting and crossing of cars going up and down are eliminated. The only other method of accomplishing this happy condition is to supply two distinct ramps in different parts of the garage. An example of this is in the Eliot Street Garage, Boston. The spiral ramp of elliptical plan may be similar to the circular, differing only in that the longer run requires more space, but allows lower grades.

Many buildings are split vertically with the floor levels of one portion staggered with relation to those of the other. The floors themselves are usually level and are connected by half-story ramps. This type is very efficient in car-storage capacity and has been widely used. In this category fall several ramp garages in Detroit, and many examples are found in other cities, such as the Bowdoin Square in Boston. They have proved very successful.

The floors may be slightly pitched upward in a counter clockwise direction and the two parts connected at the ends by short ramps. These short ramps have slightly steeper grades than the floors, but are comparatively gentle. The accompanying sketch will serve to illustrate the plan. Various refinements may be made in the basic type, such as warping of floors; banking of curves; banking of entire driving aisles, since considerable speed can be developed; and location of drainage connections at lowest points. Probably the latest modification of a ramp system on this principle is described in this manner. A continuous ramp, banked at all points, the plan and pitches described from two points, making a ramp of somewhat the nature of a spiral or helix, yet not a true helix; and while this term would indicate a circular plan, this plan is more of an ellipse, with the centers as drain points. In other words, the entire floor area of the building goes in to make up a continuous ramp to the top, the driving aisle being banked and the remainder of the floor warped away from it and slightly pitched to the point or points from which the curve of the driving aisle is struck, and to which the water naturally flows and is drained off. The recently built Fourth Avenue Garage in Pittsburgh is of this type, and another is located in Baltimore.

There is much to be said apparently in favor of this system, and little of significance against it. Briefly, its disadvantages are: (1) the limitation as to the size of building, since there must be length enough to give extremely low grades, else its purpose is defeated; (2) the fact that cars are parked on a surface which is sloped, though very slightly,—less, in fact, than the crown of the ordinary street; (3) the lack of general convertibility. A building constructed in this fashion might be used as a warehouse, but there are few other uses to which it could be adapted. The benefits credited to this variety of ramp might be summarized as all that could be desired,—low grades; good visibility; easy, fast driving; economy of space, for nothing is lost to parking; easy turning radius; great flexibility; all are combined in one ramp. At first glance, a ramp of this system, which is rather hard to grasp and visualize, might seem expensive to build. On the contrary, because of the fact that grades are low, floors, though pitched, are parallel, and there are no sharp curves, it costs little more than ordinary floor construction when once under way. It is possible also to contrive very creditable elevations for such a building in spite of staggered and pitched floors. This, then, outlines the present development of garage ramp systems. It is not meant that any one system is advocated for general use everywhere. Each individual building is a problem in itself, which must be studied and analyzed to determine what type will best fulfill the requirements under the conditions.

As a matter of interest, authentic cost figures are herewith presented, based upon a garage recently built using this last described system. The structure is 90 feet by 172 feet, five stories high, but figured for four more; it has face brick on three sides, and was designed for a net live load of 150 pounds. The cost complete, including heating plant, plumbing, push-button passenger elevator, wiring, fixtures, air compressors, architect's and patent fees, was $220,000. This figure includes a cost of $32,000 for concrete piling. This is extraordinarily low, especially in view of the prevailing rates of wages,—common labor 80 cents; carpenter labor, $1.50; brick masons, $1.75. It will be observed that the cost per square foot was under $3. It should be noted that the cost per square foot was thus moderate, or, expressed in terms of cubage, was 22 cents per cubic foot. Located in the business district of a large city in the eastern section of the country, this garage is rated at 430-car capacity. Cars can easily be driven at a speed of 30 miles per hour on grades varying



Section Through a Warped Floor Garage

from about 4 to 11 per cent. The lower two story heights are 12 feet, 8 inches, being designed for the accommodation of trucks, while the upper three stories for the parking of passenger vehicles, are 10 feet, 8 inches high. The total area available for parking on the five floors and roof is approximately 77,400 square feet. The basement is utilized as a repair shop, washrack, etc., and for the heating plant. At the present time this garage is operating successfully with a charge of 50 cents a day for transients and proportionate weekly and monthly rates.

There is a third classification of ramps, worthy of mention,—namely, the combination of the straight run with some form of the curved. This kind is used where insufficient distance is available for a plain straight ramp, and most commonly found in garages of two or three stories only. All of the types here described may be further sub-divided into single or double ramps, that is to say, ramps carrying traffic up or down, or both up and down. The majority of ramps are to carry the double traffic, this in the interest of economy; yet there are single-traffic ramps, and there are advantages to be derived from their use. Generally speaking, their place is in a garage of very large proportions, having separate entrances and exits in different parts of the building.

Before making final selection of the ramp for any garage, some consideration must be directed to the physical character of the building itself, as dictated by conditions or by the owner. For example, the desired story heights must be decided, generally from 10 feet up; the spacing of supporting columns; the width of driving aisles, 18 to 22 feet suggested; the kind of construction, whether beam and girder or flat-slab; and the treatment of the exteriors. All have some bearing on the ramp problem, as can be readily appreciated. Hence it is that the planning of a modern reinforced concrete ramp garage is something more than just another commission. The need of buildings for this purpose is very real, and many must be built in the next years. Their designing and planning constitute an interesting problem worthy of the best thought and effort, and the attempt has been made in this article to indicate the extent of the available material from which a happy solution can be worked out.

Building a Warped Floor Garage

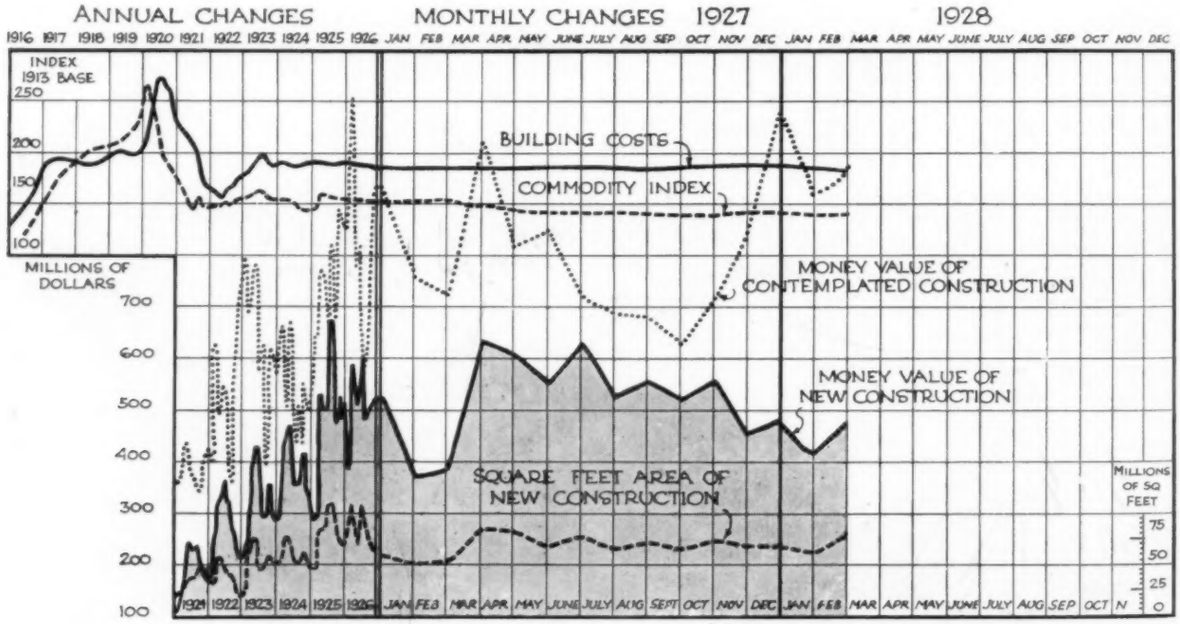
THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

THE construction figures recorded for the month of February are unusually interesting, because once again all records are broken. According to the figures of the F. W. Dodge Corporation, the value of building and engineering contracts awarded during the month of February in the 37 states east of the Rocky Mountains amounted to $465,331,300. The figure was the highest February contract total ever recorded for the 37 states. It was 9 per cent ahead of the January, 1928 total and was 18 per cent over the record for February of last year. The territory covered by this record includes approximately 91 per cent of the active building district of the country. Four districts made new high totals for the month of February, the new records being reached by New York state and northern New Jersey, the Middle Atlantic States, the Central West, and Texas. The New England States had a total which was next to the largest February on record.

Last month's contract total for the 37 states included these items of note: $238,985,100, or 51 per cent of all construction, for residential structures; $59,980,200, or 13 per cent, for public works and utilities; $57,695,400, or 12 per cent, for commercial buildings; $35,413,700, or 8 per cent, for social and recreational projects; and $34,881,300, or 7 per cent, for industrial buildings. The February contract total brought the amount of work started since the first of this year up to $892,500,000, this being a gain of 15 per cent over the amount started in the first two months of 1927. New work contemplated during the past month in these states amounted in value to $947,003,400. This figure shows an increase of 5 per cent over the amount reported in the preceding month and was 50 per cent ahead of the amount reported in February, 1927. In New York state and northern New Jersey, the value of building and engineering contracts awarded in the month of February reached the highest February contract total ever recorded, the amount being $139,071,700. This amount is 34 per cent higher than that reported in February of last year and 6 per cent higher than the figure of the previous month. It is to be noted, however, that one hotel project alone, costing $22,000,000, helped considerably to swell this total.

Of the total amount of construction recorded for February, approximately 51 per cent was for residential structures, which include houses, apartment buildings, hotels, etc. An unusual amount of residential building seems to be under way.


ANNUAL CHANGES
MONTHLY CHANGES 1927
1928
1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926
JAN FEB MAR APR MAY JUNE JULY AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUNE JULY AUG SEP OCT NOV DEC
INDEX 1913 BASE
250
200
150
100
BUILDING COSTS
COMMODITY INDEX
MILLIONS OF DOLLARS
700
600
500
400
300
200
100
MONEY VALUE OF CONTEMPLATED CONSTRUCTION
MONEY VALUE OF NEW CONSTRUCTION
SQUARE FEET AREA OF NEW CONSTRUCTION
MILLIONS OF SQ FEET
75
50
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THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost, which is determined, first by the trend of building costs, and second, by the quality of construction.

QUESTIONS THE ARCHITECT MUST ANSWER ABOUT OIL BURNING

BY

P. E. FANSLER

ASSOCIATE EDITOR, THE HEATING AND VENTILATING MAGAZINE

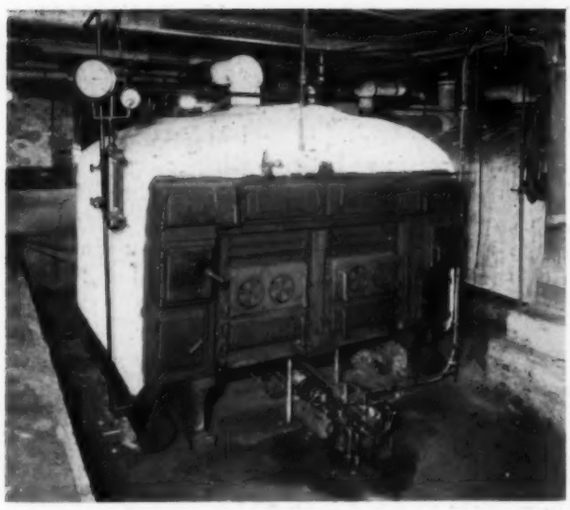
NO fewer than 700,000 domestic oil burners would have been sold during the last 24 months had one been installed in each new house built during that period. It might fairly be assumed that, indirectly at least, architects, through the heating engineers who are responsible for laying out heating plants, exercise a large degree of control over the possible expenditure of some $150,000,000 a year for oil burners. Having in mind these significant figures, it would seem highly desirable that the architect be well informed regarding domestic oil burners, in order that he may answer intelligently the questions asked by his clients. In a previous article the essential technical features of modern oil burners were described. It is now in order to deal with the most commonly asked questions, and to suggest logical and comprehensive replies.

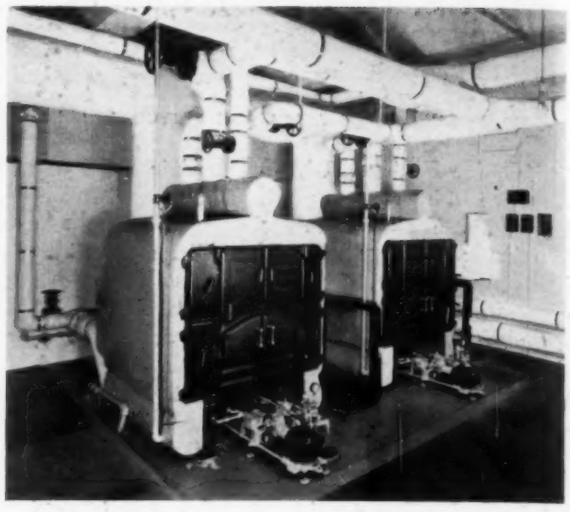
First of all the architect probably will be asked for his opinion of the value of oil burners as a generic class of equipment. Personal feeling, even if it be strongly for or against, should here be subordinated to facts based on nation-wide performance. As a general thing, architects are lukewarm on this subject, but with a leaning toward giving qualified recommendation. So many burners have been installed in almost every community, and the average results have been so satisfactory, that the architect usually has many more friends who are delighted with the operation of their oil burners than friends who are not satisfied. The aggregate opinion of 25 or more users in any community may be a safe basis of judgment, but if the opinions are based on the performance of only two or three makes of burners, certain reservations may be necessary. So much depends upon the care with which an oil burner is installed that a careless agent can easily ruin the reputation of a first class burner in his territory. I know of a case where a prominent western architect was involved in a very disagreeable situation by the installation of two burners in a single boiler. The agent realized that he did not have a suitable burner for this installation, but, rather than let a competitor get the business, he resorted to the subterfuge of putting in two burners where one of greater capacity should have been used. Throughout a winter season the owner, the architect and the agent formed a constantly wrangling trio. Finally the two burners were removed by a competing agent, a larger and more suitable type of burner was put in, and, immediately, peace reigned. The architect was justified in his recommendation of oil burning, and the owner was converted into an enthusiastic booster. In this case, had the architect been better informed on the technique of oil burning, he would not have approved the proposal of the original agent.

In my contacts with the heating industry, I have found rather more reluctance to accept the oil burner than I have among architects. One man, prominent in the industry, was vehement in denouncing "the oil-burner business" because two of his friends, heating contractors, had lost considerable money through taking on an oil-burner agency. It would seem logical to suggest that the difficulty might have come as the result of bad merchandising rather than of defective or unsatisfactory merchandise. The architect, in reading advertising, and in discussing such advertisements with his client, should strip the superlatives and exaggerations from the meat, and assure his listener that no burner is "absolutely" safe, any more than a coal-heating plant or a gas-heating plant, or an automobile is "absolutely" safe. He must admit that every burner using an electric motor, and many of the atmospheric burners, make some noise, although properly installed burners should not be audible in the living portions of the home. He might quizzically raise the question, where burners are claimed to be "perfected," as to the necessity for spending money in laboratory work if the burner is already perfect.

But the conscientious architect is bound to tell his client that oil burning in the home is, broadly speaking, entirely successful, and that every factor militating against universal satisfaction is being studied and remedied as rapidly as possible. One of the most general causes for trouble in domestic burner operation has been unsuitable or non-uniform fuel. This situation is rapidly being cleared up by the oil refiners, who see a tremendous market for partially refined products. A great many bitter experiences during the last few years have proved the necessity for close adherence to definite specifications, and all interested parties are now working on a formulation of such specifications as will remove this serious cause of trouble.

Assuming that the architect is ready to recommend oil burning, he probably will be faced with the question: "What is the best burner?" This can be answered with entire fairness and satisfaction to all concerned by recommending the three or four burners that have given the greatest general satisfaction in the neighborhood. Suggest to the client that he call on owners and get first-hand data on a few of the burners most popular in his locality. Burner performance being a combined function of the burner and of the operations of the agent, this method of selection helps to build up the business of the most conscientious burner agents and automatically assists in the decline of the fly-by-night. The selection of a burner is usually determined to some extent by the amount the client is willing to spend for it. The





Cleanliness of Boiler Rooms is Evidenced in These Workmanlike Oil Burning Installations

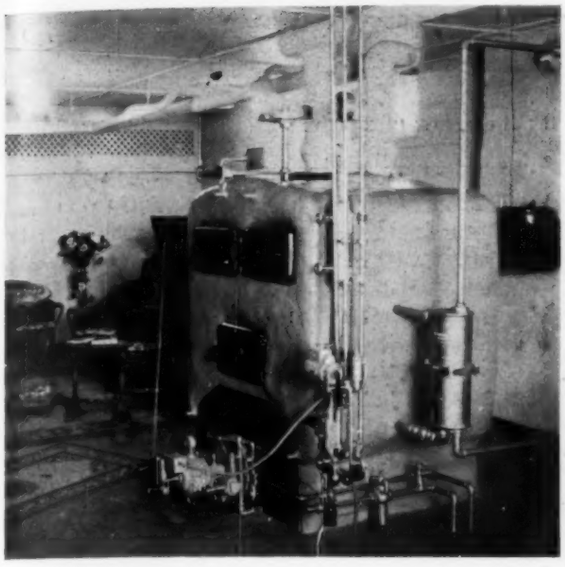
range in price of burners to supply heat for an eight- to ten-room house is just about what it is for an automobile to transport two persons. One can buy the new Elizabeth, or, by spending 20 times as much, acquire an English-built Rolls-Royce. In general, the trend of prices is downward,—that is, new makes and small and simplified burners made by older manufacturers are now on the market at $300 to $400 installed, with 275-gallon inside tanks. Burners suitable for larger houses, installed in cities with extremely rigorous installation regulations, cost up to $1200.

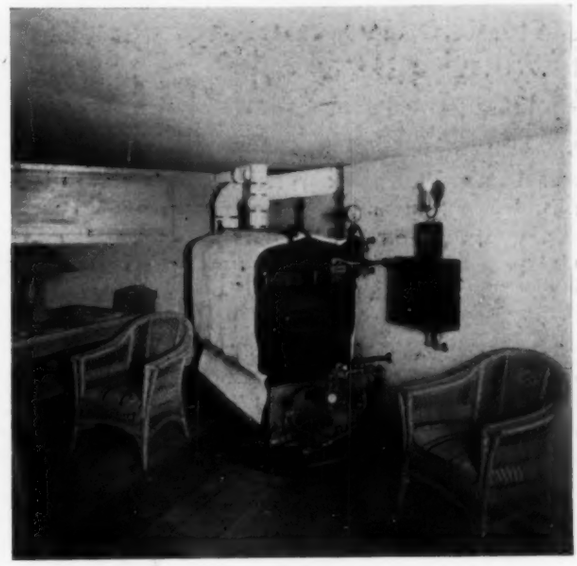
Many clients, in certain sections, and owners of small houses in other sections, will ask: "Will an oil burner be satisfactory in a warm-air heating system?" As a usual thing, extreme care must be taken in installing an oil burner in a warm-air furnace, because this type of heating plant is likely to act as a resonator and amplify and pass on any noise of combustion or mechanical noise of the burner. The air ducts offer an excellent means of transmitting this noise throughout the house. So the burner should be set on a cork or similar foundation, and if possible kept from metallic contact with the furnace. In some cases it may even be necessary to encase the burner unit with sheets of cork or other sound-deadening material; except in extreme cases, a burner can be so installed in a warm-air furnace as to be entirely satisfactory from the standpoint of noiselessness. I would suggest, however, that oil burners should be used only with the new type of all-steel furnaces having welded seams. In the old fashioned kinds, the fire pot is made up from several cast iron sections, the joints being cemented. The intense heat from the burner flame is likely to cause the cement to disintegrate, with the result that products of combustion are drawn into the jacket and spread through the house.

An oil burner should work well with any kind of a heating plant, but there are many factors that may cause its functioning to be "jumpy" or erratic. For instance, the ratio of the quantity of water in a boiler to the quantity in the radiators and piping can vary within wide limits, and likewise the action of the burner, in response to the thermostat, may vary. Again, the fact that there is liberal radiation in a house, or that it is deficient in radiation, or that it has excessive infiltration may have a noticeable effect on the proper setting of a burner, and on its working. And to these variables must be added those based upon the variations in steam and vacuum systems, with different degrees of "acceleration" in passing heat from the boiler to the air in the rooms. Any of the reliable burners can be so installed as to give entire satisfaction in any kind of a system, but the setting of the burner must be intelligently determined to best suit the specific conditions encountered.

There is one tremendous advantage offered through the use of either oil or gas fuel,—the ability to utilize a large portion of the basement for living or recreation purposes. This is not a fictitious advantage, for houses are now being designed and built in which all but a tiny portion of the excavated portion is to be play room, billiard room, study, or other useful adjunct to the up-stairs portion. Sixty square feet of floor space is sufficient to allow for a boiler and burner, and this is but a fraction of the area of an ordinary basement. The space gained through burning fluid fuel is not merely that saved from the no-longer-needed coal bin; it results from the cleanliness inherent in the basement where fuel is fed automatically through a pipe. A growing number of plans have taken full advantage of this situation, and added approximately 30 per cent of usable space to the houses at no cost but that of decoration.

One question that the architect can count on being asked is "Is there enough oil in sight to justify the investment in a burner?" A near-panic was precipitated by the report of a federal commission about a





Boiler Rooms Equipped with Oil Burners Can Become Part of the Living Quarters of the House

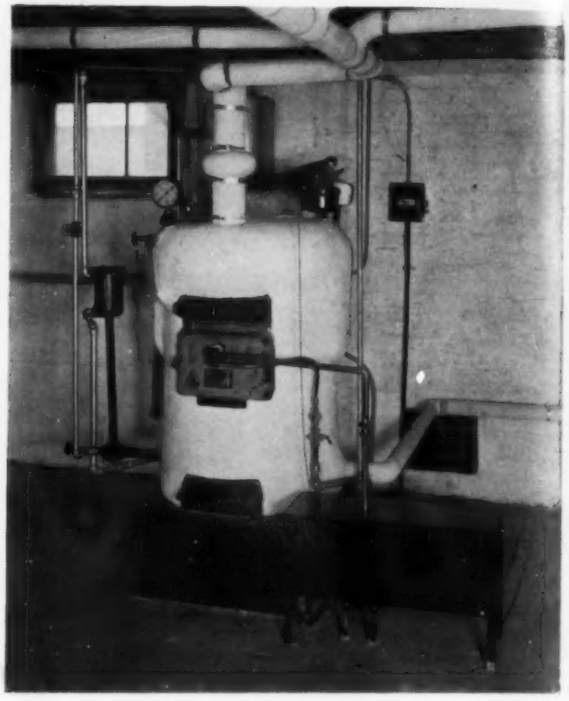
year ago, indicating a shortage of oil, and a great deal of "explaining" followed. As a matter of fact, no one has any conception of the aggregate crude oil resources of the United States, or any other country. Several years ago experts announced what the oil reserve was supposed to be. In the interim more oil than this estimated reserve contemplated has been brought to the surface, and the known bulk of oil is now greater than it was at the time when this statement was issued. Only last month a report was given out leading us to believe that the hidden supply of oil is much greater than ever has been dreamed of, and certainly it is not likely to be consumed for many years to come.

It is my feeling that the consumption of gasolene by automobiles will not materially increase. The ton-mileage of trucking is bound to grow enormously, but the truck of the near future will not burn gasolene,—it will be powered with a Diesel engine using distillates ranging between 24° and 36° A.P.I. The change from use of gasolene engines to heavy-oil engines for marine purposes has already gone a long way toward the ultimate, and except for engines of small power and those of high speed used for special purposes, the marine gasolene business is on the down grade. All this means that gasolene consumption will not grow in proportion to the increase in aggregate automobile horsepower, and that the increased need for "cracking," so marked during the last few years, will not be felt in the future. "Cracking" is the term used in the oil industry to designate the refining of crude oil into lighter oils or gasolene. These cracking stocks will then become available as domestic fuel, adding enormously to our present stocks.

"How much oil capacity should be installed with an oil burner?" is a frequently asked question. This is largely a matter of local conditions,—proximity to oil stations, promptness of service rendered, condition of roads, and normal character of the winter weather. Usually there is such a small difference between the cost of an installation with a 275-gallon basement tank and one with a 1000-gallon outside tank, that it would be good insurance to put in the latter. In many sections of the country it is common practice to install tanks above the surface of the ground and to cover them with neat housing, or to allow vines to run over them. This reduces the cost of installation, but this practice would not be tolerated east of the Mississippi River. If a burner is installed in a house where oil trucks constantly pass within a few blocks, a small tank will suffice, particularly if the service is good. I would recommend, however, getting away from basement tanks and using only 1000-gallon and larger buried tanks, merely as a good investment in fuel storage and reserve. The average house may require 200 gallons of fuel per heating season, and for such a building a 1000-gallon tank would be about right.

There is one question that is always asked in a discussion of oil burning: "How does oil heat compare in cost with heat from a coal-fired plant?" The only proper answer to this query is that there is no proper comparison. Solid fuel gives one kind of a result; fluid fuels,—oil, gas or district steam,—give an entirely different kind of "heat comfort." Logically, the costs should not be compared. No one, after having used a decent oil burner, or a gas-fired heating plant, or "street steam" would attempt to compare them with a coal-fired plant. He would say: "I'm getting real heating comfort of a kind I had never known. My fuel is automatically fed, thermostatically controlled, so that the temperature in my house is always just what I want it, and there is no dirt, no dust and no residue to remove. Cost comparison is out of the question." Two years ago I sent a circular letter to a number of persons who had

A Separate Oil Fired Hot Water Heater



An Indirect Hot Water Heater

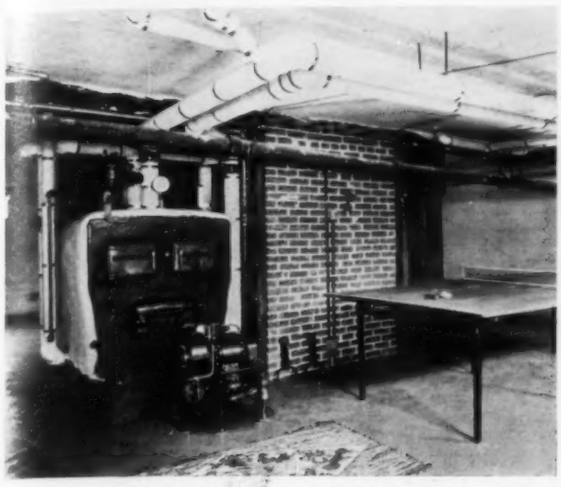
Methods of Heating Domestic Hot Water Supply with Oil Fuel

used oil burners for two or more years,—they had had experience. I asked them, among other questions, how much more they would pay for oil fuel than for coal before they would revert to coal. The figures given in the replies varied between 25 and 200 per cent, and the mean was almost exactly 100 per cent. In other words, the average man was willing to pay twice as much for oil heat as for coal heat.

In a recent article, Dr. R. T. Haslam, of the Standard Oil Development Co., a leading technician on the subject of the utilization of fuels, said that a high class burner of the present day, properly installed and adjusted, should produce heat at a cost not exceeding that of equivalent heat produced by burning anthracite coal. Of course, this is a general statement, but it is unbiased and authoritative. I would say that equivalent heating should be produced by oil fuel at costs varying between 10 per cent less than and 25 per cent more than those for coal in the same territory. As a general thing oil burners are not removed. Once in a while we learn of a locality where burner removals cause considerable comment. Two causes usually explain the situation. Either a salesman has "cleaned up" in a given locality, with a cheap burner that is not worthy of the name, or a really good burner has been damned through the high-pressure, careless installation policy of a "get-rich-quick" type of agent.

The life of a good burner is not known. Burners built on the Pacific coast and installed more than 20 years ago are still in service. Some of these are about as efficient as the modern units, although not automatic in operation. A high class burner heating a house for the first time this winter should give ten years of heating comfort without major repairs. It might be well to overhaul twice during that period. If kept free from dirt and dust and properly lubricated, there is little to wear out and require replacing. I should expect any one of the dozen burners that I might select for my own house to serve me well for at least 15 years, and I am certain that any one of them would be able, mechanically, to do so. The life of underground tanks is not known, but, based on installations made 15 years and more ago, the tanks installed today should last for at least 20 years. Cinders should never be used to fill in around oil-storage tanks, as water seeping through the cinders causes the formation of destructive acids. Special attention should be given to tank installation in those rare locations where corrosion follows the placing of iron in the earth. None of the oil fuels in common use for domestic heating will freeze in the coldest winter weather, either in buried or in exposed tanks. Some oils will congeal to such an extent as to cause faulty operation of the oil pumps, but where a reputable agent advocates the use of heavy fuel, provision always is made for maintaining the temperature of the oil in the tank and pipe line at such a point that proper viscosity is insured. This is usually done through the medium of a steam or hot water coil connected to the heating plant.

The two problems that loom before the oil-burner manufacturers today are those of proper installation and service. We have discussed the former; the latter is not yet settled. The oil burner is a simple, rugged, yet at the same time delicate mechanism. It



Utilization of Oil Fired Boiler Rooms Without Decorative Modification

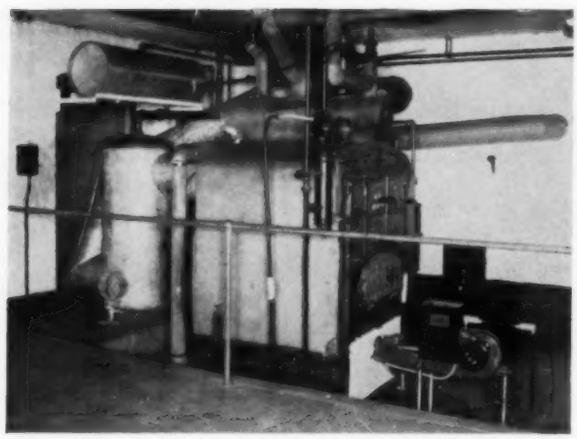
Boiler Room as Children's Play Room — Boiler Room as Adjunct to Study

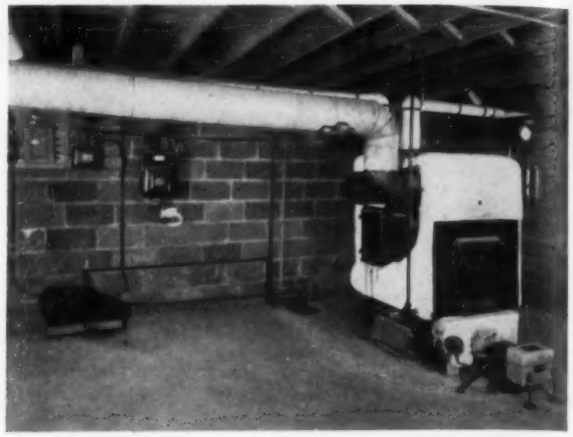
should not, as a general thing, be played with or adjusted by the average servant. Service should be available at all times, although it may never be needed. To meet this requirement some dealers are providing service free for the first month, or two, or three, and then charging for service at a definite fee per call, by the hour, or for a fixed charge per heating season. In the last case there is included a general overhaul of the burner in the spring, its storage or proper protection from dust during the summer, and a check-inspection at the beginning of the heating season. If a home owner has an appreciation of high class machinery and its abilities and limitations, he may go through an entire heating season without requiring a service call;—many do. On the other hand, if he or the servants are careless and unappreciative, allowing dust and dirt to get to the burner and giving no heed to its operation, such a plant may need cleaning and oiling by a service man once a month. Twenty dollars a year should provide service for the typical good burner in average hands. Present-day charges may exceed this by $5 or $10, largely on account of lack of density of population in any community. When there are more burners in use, service charges will naturally drop.

Oil burners are, as a usual thing, delicate in adjustment; that is, a slight variation from a certain setting will materially decrease the efficiency of the burner. This does not mean, however, that burners are unstable. The usual practice is to have air and oil adjustments so made that special keys are required. This prevents tampering with the setting by any other than the authorized and qualified agent. It is not impossible to so adjust a given burner that it will produce heat at a given rate and then make another adjustment that will double the quantity of oil required to generate the same amount of heat at the boiler outlet. This is because it is very easy, when setting the burner by eye, to so adjust it that a tremendous amount of excess air goes through the combustion chamber.

It would be of great benefit to the house owner if every architect required that burners be set on the basis of a gas analysis made with an Orsat apparatus. This might well be made an item in the architect's specifications. This apparatus furnishes exact data on the character of the flue gases, and, with a thermometer giving the flue-gas temperature, it is a simple matter to adjust the burner for maximum efficiency. The cost of making the final adjustment in this exact way would be only a dollar or two more than leaving it to the eye of the installation man, and the results certainly would justify the requirement.

The matter of safety, where oil is the fuel, I have left to the last. Two years and more ago this was a pertinent and often-asked question. Today there is a pretty general understanding of the facts. In this interim the National Board of Fire Underwriters has made a careful study and analysis of oil-burner fires, and the data accumulated indicate that the risk in a house burning oil fuel is no greater than in a house burning anthracite coal, and much less than where soft coal is used. The fact that no additional premium is charged for domestic fire insurance should be conclusive evidence on this point. It is unfortunate that a great many people interested in the sale of coal have undertaken to carry on a terrorist campaign through advertising in local newspapers, using articles about oil-burner fires, set up to resemble news items. One such, in a New Jersey paper, I traced through 14 offices and "news" agencies. Finally the fire chief in the city where the "fire" happened branded the story as a gross exaggeration. Careful installation in accordance with the regulations of the National Board of Fire Underwriters is the best guarantee of safety. Nearly every manufacturer requires that his burners be so installed, and these standards are being adhered to by members of the oil-burner industry, who realize the importance of this phase of their work. The Underwriters' regulations are not in any way overstrict or objectionable, but in some cities the author-





Two Radically Different Types of Oil Burners
Motor, Blower and Nozzle in Single Unit — Motor Driven Blower Separate from Nozzle Element

ities pass regulations that are unnecessarily harsh. The extra costs involved are always passed on to the purchaser. In New York, for example, it costs about $200 more to install a high class burner than it does in nearby cities, or even in the other large cities in the country. This premium of 20 per cent does not seem to be offset by evidences of greater immunity from fire.

Finally, there is the question, never omitted: "What burner would you recommend?" First, as to type, there are no data to show that any one type is generally superior to others. There are no data to prove that any shape of flame is more efficient or desirable in all types of boilers than are other shapes. The installation man who knows his business can adapt almost any type of burner to give excellent results in any boiler or furnace that is fit for an oil-burner installation. The long fox-tail flame produced by some burners seems particularly adapted to the long, narrow combustion chambers of sectional cast iron boilers. The same long flame can be utilized in round-type boilers through the proper use of refractory materials. And in the steel boilers that are available for house heating, such a flame fits beautifully;—but the same thing is true of the other shapes of flame, with few exceptions. Proper installation will make any shape show excellent performance in any shape of combustion chamber, provided always that the burner will handle oil at the necessary rate to carry the boiler at the maximum load required. It has been amply demonstrated that the average boiler, particularly the larger steel types, will carry more of an overload with oil fuel than when fired with coal. This is largely because higher temperatures can be maintained in the combustion chamber without variation, and because there is no "firing period." The burner can be set to burn continuously, and the output of the boiler maintained at 150 to 200 per cent of its normal rating. This is one reason why the installation of an oil burner is frequently followed by more satisfactory heating,—the boiler ability is increased with the change in fuel.

A definite warning should be sounded, however, against attempting to bolster up the operation of a "sick" heating plant by installing an oil burner. Many and many a burner has been sold on the promise that it would heat rooms that never had been comfortable when coal was used. This situation, of course, does not arise in connection with new houses. It is obvious that insufficient heat in any portion of a house is the result of too little radiation, too small piping, improperly run lines, or similar defects. These should be corrected, if it is desired to improve results; the remedy is not merely in a change of fuel.

From a constant and careful study of the development of heating with gas, oil and coal, I feel certain that we are at the beginning of a nation-wide trend toward the use of fluid fuels. Gas and oil are the domestic fuels of the future,—the former where it is available at a reasonable price, and the latter in the tremendous areas where gas is not to be had, or is excessive in cost. Fundamental economic laws will provide for a balancing of unit fuel costs against the relative benefits accruing from the use of each kind. One trait is characteristic of Americans, and it is daily growing more pronounced,—the readiness to pay generously for bodily comfort and for any desired attainment at a minimum expenditure of effort, physical or mental. This explains, in large measure, the ready acceptance of gas and oil as domestic fuels, and the possibility of a complete change from solid to fluid fuels within the space of a dozen or more years. The architect who will best advise his client in this matter will follow the present developments in the burner and fuel industries and judge with unbiased attitude the merits of the case from data gathered in nation-wide studies. Oil-burner manufacturers are banded together in an honest and earnest endeavor to improve their respective mechanisms, to raise the standards of merchandising, installation and servicing, and the oil producing and distributing interests are striving to standardize oil fuels and provide for delivery with minimum effort on the part of the home owner. These activities are so sincere that there is no doubt of early attainment of their aims.

BUSINESS AND FINANCE

THE ARCHITECT AND REALTY DEVELOPMENT

AN INTERVIEW WITH ROBERT TAPPAN, ARCHITECT

BY KENNETH KINGSLEY STOWELL

THE field of speculative building is one which architects seem to have neglected, and yet, when we stop to consider that over a billion dollars are spent each year in the construction of small houses costing less than $25,000, it would seem to be fertile for the architect's activities. Probably less than 10 per cent of the small houses built in the United States last year were designed by architects. It would hardly do for the architect to merely shake his head and condemn the ugliness of the speculative houses, without making a serious attempt to improve their quality. Is it not a civic duty for the architect as well as an opportunity? The speculative builder needs the services of the architect, and arrangements can be made that will be mutually advantageous, and there will be a large unearned increment for the public at large in more sightly suburbs and in more agreeable and efficient living conditions. Perhaps the situation will be clearer if we draw the analogy between custom tailoring and ready-made. Most people would be glad to wear custom-made clothes if they could afford it, but the large majority, for economic reasons, are forced to use the ready-to-wear. The same is true in housing as in clothing. Most people would prefer to have their houses designed individually for themselves, but the lack of cash forces over 90 per cent to live in "ready-made" houses. Here the analogy falls down, perhaps, as we find the ready-made clothing approaches closely in design the custom-made. The speculative house seldom has the advantage of good design.

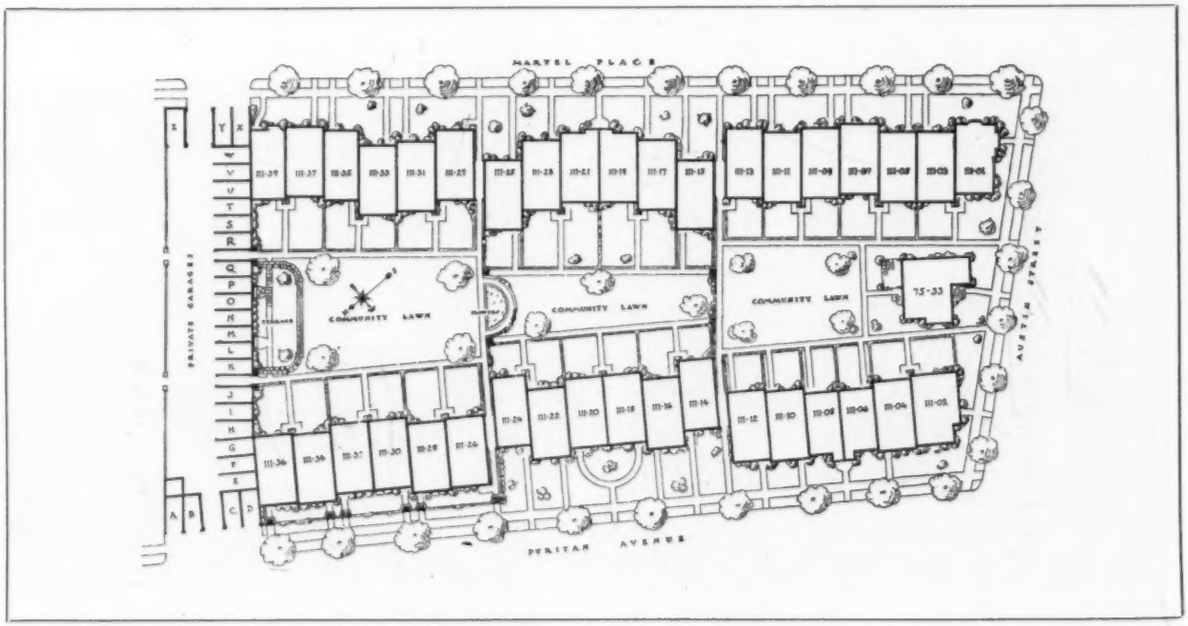
The Attitude of the Architect. It may be better to consider the ways and means by which the architect can help to remedy existing conditions rather than to try to fix blame on either the speculative builder or the architect. The architect cannot hope to coöperate with the speculative builder unless he is willing to analyze the builder's position and to grasp the economic considerations that are always uppermost in the builder's mind. He must realize that the builder is investing a comparatively large amount of money, and that his risk is great. The architect, in connection with a project of this kind, is risking a few hundred dollars, whereas the builder is investing thousands. The architect must be able and willing to consider the whole project from the builder's viewpoint. He must often ask himself the questions, "What would I do if I were in the builder's position?" "What would my reaction be to this if it were put up to me as the builder?" This sympathetic understanding can only be the result of a conscious effort on the part of the architect,—an effort, perhaps, which many architects are unwilling to make. It will mean a sloughing off of any over-bearing propensities or superiority complexes, with which most builders feel that the architect is endowed. It means "playing the game" with the builder. It means the elimination of much that is, to use the vernacular, "high hat." The architect must learn to talk in the language of the builder, in the beginning, and to educate him, as things develop, to the advantages of good design.

The speculative builder rarely considers consulting an architect of merit because he feels that the archi-

General View of Forest Close, Forest Hills, N. Y.
Robert Tappan, Architect

Interesting Grouping and Texture at Forest Close
Robert Tappan, Architect

tect's fee is out of proportion to the service he renders; and he also feels that the architect will, through failure to fully understand the economic aspects of the problem, incorporate expensive features in the designs for speculative houses. Nothing can be done unless the architect is able to convince the speculative builder that he will be able to make his services pay, or more than pay, for themselves, when considering the project as a whole. In other words, the architect's argument must be that he can help the speculative builder to sell his houses faster and for more money because of their good design than would

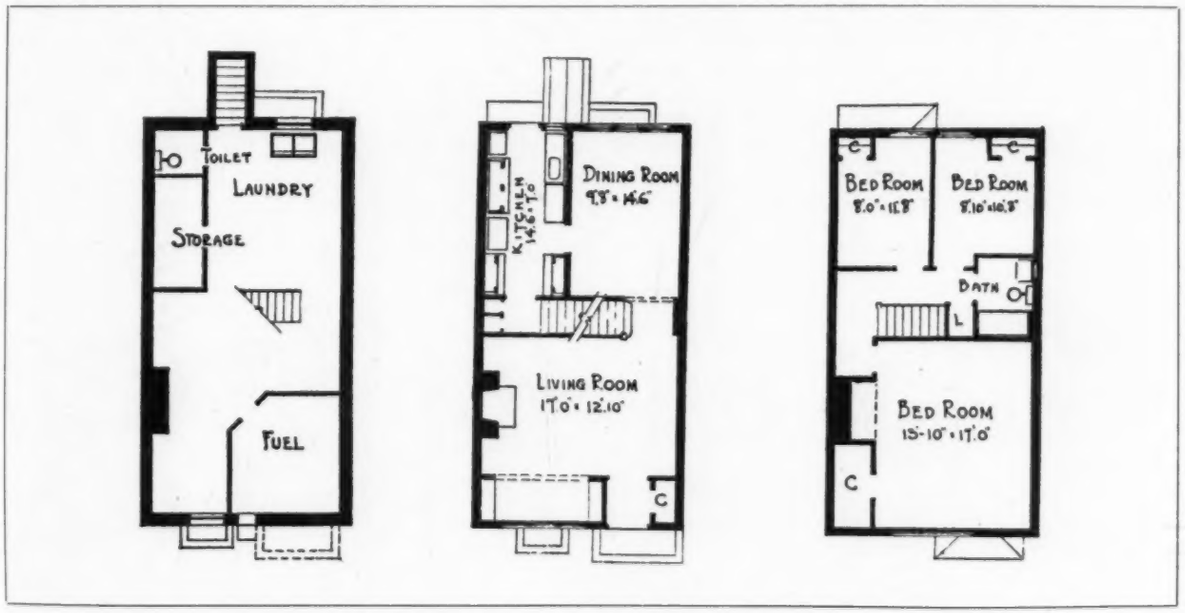


General Plan of the Development

View in the Garden of the "Close"
Robert Tappan, Architect

otherwise be the case. He must also convince the builder that the houses he designs will be no more expensive to build than those produced by someone with less training and experience in architectural design. The architect can help the builder to get larger loans proportionally from the bank for his project because the designs are attractive to buyers and the materials and workmanship specified by the architect are of a quality that will insure the safety of the investment.

The question for the architect is "How can I convince the speculative builder of the facts just men-



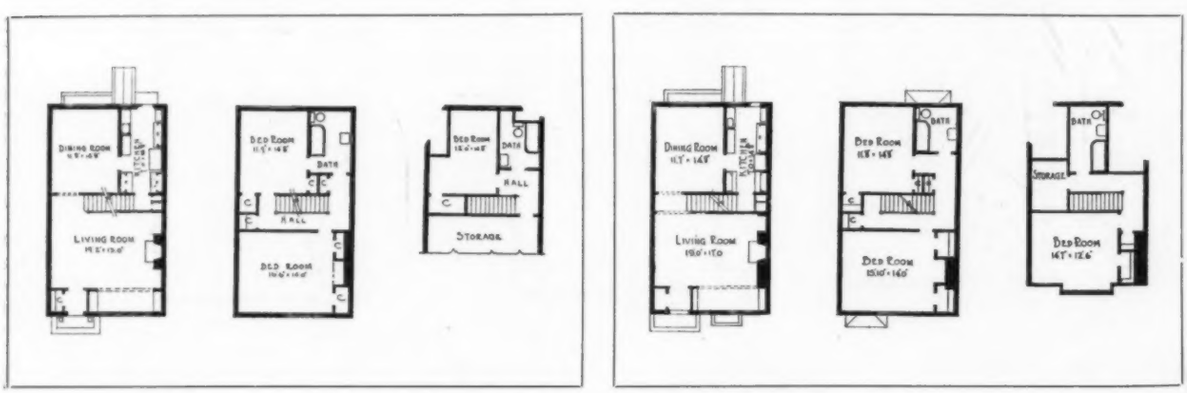
Plan of Houses Each Having Six Rooms and One Bath

Variations in Exterior Design Add to Attractiveness

tioned?" In the first place, results accomplished are usually the most convincing argument. For that reason, the Forest Close development, at Forest Hills, New York, is given here as one such instance.

In the second place, the architect must be willing to prove his point graphically. He can do this by offering to take the plans that the speculative builder has used on former projects and to make sketches showing how these plans can be altered for greater efficiency, for saving of labor and materials, and, especially, to make the houses more readily salable by excellence and attractiveness in design. This latter method has proved convincing in many cases, and it is satisfying to know that this demonstration of ability has convinced the speculative builder, and he has invariably come back to the architect for each new project. The making of contacts with speculative builders should not be difficult. It would be wise for the architect to consult first the one or two leaders in this field in his locality. He may find these men the most receptive to ideas that will be to their mutual advantage.

The Architect's Fee. Perhaps this, rather than any other consideration, deters speculative builders from employing architects. The much advertised 6 per cent will often scare off the speculative builder who usually pays $40 or $50 for a set of blue prints which he "buys." The flat fee of a certain stipulated sum, based on the architect's past experience, is the best basis on which to charge the speculative builder for architectural service. The percentage and the "cost plus" systems of charges have not been found advantageous for use in this type of work. The architect should insist on supervising the work. Only in this way can he make sure that the results will warrant his employment. He will not be able to make good his claims of greater salability because of attractiveness and quality if he does not have control of the execution of his designs. The supervision is as much a part of his helpful service to the prospective builder as his original design. The architect must be prepared to meet the builder halfway on the question of fee. He must not expect the same size fee for this sort of work as he would expect in working for the client building an individual house. This is entirely compatible with his own business judgment and the ethics of the profession. This type of work requires less effort on the part of the architect in comparison with the amount of money involved, than many other buildings designed for the individual client. The architect is relieved of the necessity of complying with the whims of the client and the constant changes in plan that must be made in connection with the usual small house problems. Having



Plans, Six Room Houses, Each with Two Baths

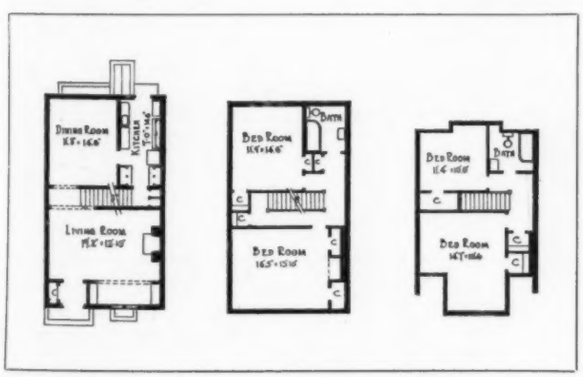
The Garages are Placed at One End of the "Close"

worked out one or two plans for the speculative builder, variation is obtained by alternating these plans and by grouping standard facades in order to make an attractive ensemble.

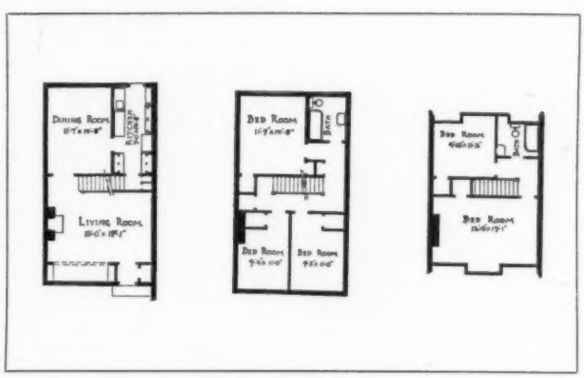
In determining the requirements of the project, the builder usually has a fairly definite idea of the practical requirements in regard to the number of rooms and the selling price, which largely determines the plan and character of the development. The builder is usually in a better position to set forth these requirements, because he is in direct touch with the buying public, and the architect as a rule has very little knowledge of real estate selling conditions in the locality of the development. The builder's ideas will usually be found sound on these subjects. The architect can, by modifying and rearranging the plan ideas of the builder, produce more attractive and more efficient houses. This is especially true in regard to the grouping and group arrangement. In this connection composition, relation of masses, relation of wall to fenestration, and considerations of texture are much more important than small details. The position of the window in the facade and its relation to the whole composition are much more important than the actual detailing of the window itself and its trim. The architect should take advantage of the builder's knowledge of the most economical detailing and not be too insistent on special moulding profiles. The architect can select the best of stock designs for their architectural effect without adding to the cost of the building. The builder is usually unable to make as wise a selection, and consequently would produce a poorer looking building if the choice were left to him alone, without the benefit of the training and taste of the architect.

Throughout the entire project every consideration must be given to economy of materials and labor. The builder and architect, working together, can produce buildings worth while architecturally for no greater cost than buildings of like accommodations and size that are lacking in the essentials of good design.

The "community garden" type of development has proved an excellent form of housing venture for the speculative builder. There seems to be an instinctive desire to own a small plot of ground and a single house of one's own. The "community garden" development meets this instinctive desire and yet makes possible the building of homes at a smaller cost than would be involved if each house were separate. The party walls effect a great saving, and the small houses gain in appearance by being incorporated in the design with their neighbors. The houses, though they may be small, do not appear as tiny or as tall as they would if they were constructed separately.



Seven Room House with Two Baths



Eight Room House with Two Baths

As an indication of the quality of construction that the enlightened real estate developer is adopting, we quote here the essentials of the specifications of Forest Close.

FOOTINGS: Solid concrete 12″ x 24″ under all walls.
FOUNDATIONS: Solid concrete 12″ thick.
CELLAR FLOOR: Solid concrete 3″ thick.
EXTERIOR WALLS: Brick, laid in Portland cement mortar. Metal pans are set under and over all windows.
STUCCO: Portland cement, troweled finish.
STEEP ROOFS: Graduated slate laid over 30-pound roofing felt and fastened with copper nails.
ROOF DECKS: Ten-year guaranteed tar and gravel roof.
FLOOR JOISTS: 3″ x 10″ Douglas fir.
RAFTERS: 3″ x 8″ and 2″ x 6″ Douglas fir.
PARTITIONS: 2″ x 4″ spruce, 16″ on centers, non-bearing.
PARTY WALL: Concrete block, 8″ thick.
CELLAR WINDOWS: Steel sash and frames.
DOUBLE HUNG WINDOWS: White pine.
EXTERIOR TRIM: Selected white pine.
LEADERS: 16-ounce copper.
GUTTERS: 16-ounce copper.
FLASHING: 16-ounce copper.
FURRING: All exterior walls furred, for air space.
LATHING: 24-gauge metal lath throughout.
PLASTER: Patent plaster, troweled and smooth finish.
WATER PIPE: Solid brass throughout.
STEAM BOILER: Latest model round boiler.
WATER HEATER: Automatic gas storage system, with heater connected to furnace.
PIPE COVERING: Asbestos air cell.
RADIATORS: Cast iron of approved design.
AIR VALVES: On all radiators.
BATH ROOM FIXTURES: Of best quality.
BATH ROOM WALLS: Tiled to ceiling.
BATH ROOM FLOOR: Ceramic mosaic tile.
KITCHEN FLOOR: Cork composition.
ALL OTHER FLOORS: Select grade oak ⅞″ thick, laid over sub-floor.
INTERIOR TRIM: Selected white pine.
STAIRS: Oak treads, wedged and glued.
DOORS: Single-panel—1¾″ birch.
HARDWARE: First quality throughout.
ELECTRIC WORK: B/X cable for wiring.
ELECTRIC FIXTURES: Ample base plugs and distinctive selected fixtures.
PAINTING: All painting is lacquer applied with air brush.
SHADES: Non-fading linen.
SCREENS: Copper bronze throughout.
WEATHER STRIPS: Copper bronze friction strips on all windows and exterior doors.
GAS RANGE: Furnished with the house.
KITCHEN CABINET: Steel of most convenient pattern.

The sales policy for houses of this type is also of interest to architect, builder and prospective owner. A part of the purchase plan of the Cord Meyer Development Company for this group is given here.

SIX-ROOM HOUSES						SEVEN-AND EIGHT-ROOM HOUSES			
$16,100	$17,100	$18,200	$18,800	$19,600	PRICES	$20,000	$20,500	$21,000	$22,500
1,610	1,710	1,820	1,880	1,960	Cash	2,000	2,050	2,100	2,250
8,000	8,500	9,100	9,400	9,800	First Mortgage	10,000	10,000	10,500	11,500
6,490	6,890	7,280	7,520	7,840	Second Mortgage	8,000	8,450	8,400	8,750
Estimated Yearly Carrying Charges									
480	510	546	564	588	First Mortgage Interest at 6 Per Cent, Payable Semi-annually	600	600	630	690
					Second Mortgage Installment which pays off this Non-callable Mortgage in Ten Years				
888					$74 per month on $6,490				
	936				78 " " " 6,890				
		984			82 " " " 7,280				
			1,020		85 " " " 7,520				
				1,056	88 " " " 7,840				
					91 " " " 8,000	1,092			
					95 " " " 8,450		1,140		
					95 " " " 8,400			1,140	
					99 " " " 8,750				1,188
245	254	270	278	289	Taxes, Approximate	297	302	311	332
8	8	9	15	15	Water, Approximate	15	15	15	15
11	12	13	13	13	Fire Insurance, Approximate	14	15	15	16
$1,632	$1,720	$1,822	$1,890	$1,961	Total Carrying Charges	$2,018	$2,072	$2,111	$2,241
					Included in these totals are the average annual reductions of the second mortgage				
649	689	728	752	784	principal; therefore deduct	800	845	840	875
983	1,031	1,094	1,138	1,177	Leaving Total Yearly Net Charges of	1,218	1,227	1,271	1,366
Yearly Charges on a Monthly Basis									
136	143	152	158	164	Total Monthly Cost	168	173	176	187
54	57	61	63	65	The Average Reduction of the Second Mortgage Per Month	67	70	70	73
$82	$86	$91	$95	$99	Leaving Net Cost Per Month of	$101	$103	$106	$114

To purchase a $1,400 garage adds $140 to initial cash payment; $700 to first mortgage; $560 to second mortgage. Second mortgage monthly payment is thereby increased $7.

Purchase Plan for Forest Close

ESTIMATING CONSTRUCTION COSTS

CONCERNING METHODS ESPECIALLY ADAPTED TO THE ARCHITECT

BY

CLAYTON W. MAYERS

VICE-PRESIDENT, MORTON C. TUTTLE CO.

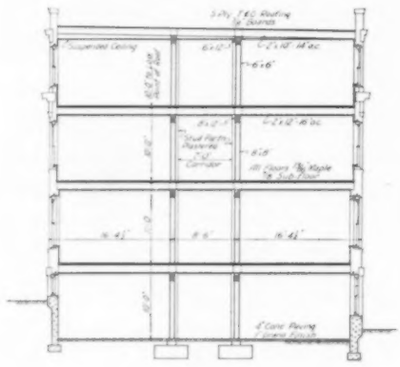
NEARLY every architect is acquainted all too well with the unpleasantness experienced in completely revising a set of plans and specifications on which bids have been taken and costs found to be prohibitively high. Such an experience is, however, very much more disagreeable when the procedure is necessary in order that the cost of the finished project be kept within a set limit which heretofore the architect had felt certain would be met by the requirements of his design. The fact remains, however, that he has either been too liberal in refinements and ornamental details or,—what is more unfortunate,—embarked on a project the size of which was too large in the first place. Whatever may be the reason for the necessity of cutting down the design, the work which must be done is not only irritating and disagreeable but expensive, in that the process calls for seemingly endless changes to drawings and specifications.

Frequently the result of all this work of revision produces an unbalanced design not at all in keeping with what the architect had originally intended or what the client had expected. Were it not for the pressure of time, making a fresh start might be the wisest way out, but generally the client has already become impatient to begin operations, and now being obliged to forego many of the features incorporated in the original design, becomes more and more disgruntled. Thus the architect is placed in an exceedingly embarrassing position. It is expected that he will be able to make changes quickly which will result in a lowered cost, all without impairing seriously the attractiveness or usefulness of the structure. Eventually the changes in plans and specifications are completed, and as a result, the architect becomes involved with the design and construction of a building very different from his original conception, one in which he can take but small if any pride; in fact, it may be that he would much prefer that he had been disassociated with the project altogether. Perhaps, too, on account of the many hours spent in revising the drawings, the architect finds that he is actually out of pocket, a condition which cannot help but add to the keenness of his disappointment. Much better had he planned a somewhat smaller or more simple structure, a building development in which he could take justifiable pride.

There is a reason for such a state of affairs, and an avoidable reason. A wrong start has been made, and when the start is wrong the course is also wrong, and the result correspondingly unsatisfactory. It may be that the size of the project as originally visualized did not correspond with the amount of funds available for its development. It may be that the size was correctly established, but that the character of the structure and materials and the elaborateness of the developed details were to blame for the disappointingly high figures submitted by the contractors. Whatever the reason, this unhappy condition could have been averted had the architect given proper consideration to "cost" at the critical time,—namely, during the early stages of the development of the plans.

On this point of cost, the architect, having obtained some generalizations as to what the client could spend, might have made certain mental reservations as a safeguard against surprise, and prepared sketches accordingly. The estimate of cost perhaps consisted of a simple calculation in which the cubic contents of the proposed structure were multiplied by a cost per cubic foot, which represented the best guess of which, at the moment, the designer was capable. Making such an estimate frequently constitutes the sole means of judging cost of the building until the designer's plans have been fully elaborated, his specifications written, and the whole put to the test of competitive bids from a number of contractors. All through this period of designing, there is no certainty that the design will prove capable of development within the limits of cost previously set. There is always a chance, however, that the design may have sufficient appeal to permit an expansion of the limits of cost as set by the client. In such a case, the architect may be more fortunate than skillful!

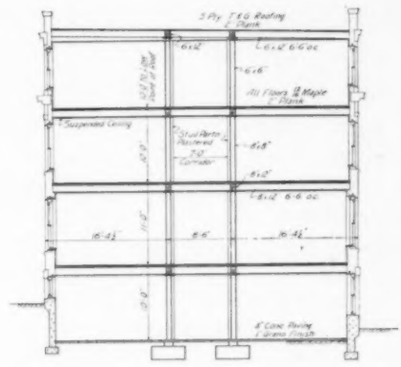
So many factors enter into the cost of construction work that it is only by making preliminary estimates during the early stages of design that an architect can be reasonably certain that he is on the right road. Such estimates should be the product of a building cost expert working closely with the architect. It is only by such a procedure that the architect is assuring his client of skillful and competent service. Where a building,—whether it is an office structure, a factory, a hotel or a large apartment house,—must return income proportioned to the capital investment which it represents, such procedure alone is intelligent and fair. This cost expert should be a man in close touch with the actual cost of work done in the construction field. He should be working not merely from records, in many instances established by persons and under conditions unfamiliar to him, but from information gained at first hand, which should be extensive enough to permit his qualifying to speak with a certain degree of authority. The architect can depend upon the information so furnished in working out the design of the entire building, from footings to parapet cap. By the judi-



SECTION A
"JOIST CONSTRUCTION"

Floor Area 2,145 square feet
Cube 22,255 cubic feet

	Quantity	Price per Unit	Cost $
Concrete Work—			
Interior and exterior footings, including material and labor and plant costs	4-1/5 c.y.	15.00	63
Basement walls	10 c.y.	15.50	155
Paving (floor on ground)	6 c.y.	13.25	80
Granolithic finish on paving concrete	502 s.f.	.12	60
Steel caps on interior footings	No. 2		10
Formwork—			
Forms for interior and exterior footings, including labor, material and plant	112 s.f.	.30	34
Forms for basement walls including labor, material and plant	460 s.f.	.35	161
Reinforcement Steel, including material and labor	6/10 tons	92.00	55
Structural Steel lintels, including material and labor	1000 lbs.	.06	60
Masonry—			
Brick walls	623 c.f.	1.40	872
Hung ceiling of metal lath and plaster	225 s.y.	2.50	562
Plaster on exterior walls, partitions, interior wood columns and girders	300 s.y.	1.40	420
Metal lath on stud partitions	194 s.y.	.40	78
Carpentry Work—			
Wood furring and grounds in place for metal lath work			100
Stud partitions (ready for metal lath work)	872 s.f.	.078	68
Hard pine framing (LLYP) Material and labor of erection	1-2/10 M	103.50	124
Spruce beams, material and labor of erection	3-6/10 M	67.00	241
7/8" sub-flooring and roof boarding, material and labor of erection	2-3/10 M	50.00	115
7/8" maple top floors (material delivered at site)	2 M	90.00	180
Lay maple top floors, including nails and paper	15-1/3 sqs.	6.00	92
Cast iron work for framing (bases, caps and anchors)			50
Nails, spikes, etc., for plank and spruce framing work			10
Painting walls and ceilings (2 coats)	246 s.y.	.35	86
5-ply tar and gravel roofing (on wood roof)	5-1/10 sqs.	15.50	79
Net estimated cost of one bay only			$3,755

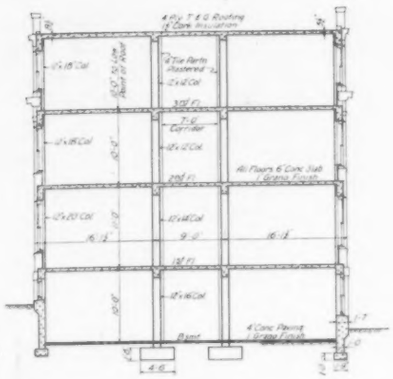


SECTION B
"MILL CONSTRUCTION"

Floor Area 2,145 square feet
Cube 22,255 cubic feet

	Quantity	Cost per Unit	Cost $
Concrete Work—			
Interior and exterior footings including material, labor and plant costs	4-1/5 c.y.	15.00	63
Basement walls, including material, labor and plant costs	10 c.y.	15.50	155
Paving (floor on ground)	6 c.y.	13.25	80
Granolithic finish on paving concrete	502 s.f.	.12	60
Steel caps for footings	No. 2		10
Formwork—			
Forms for interior and exterior footings including labor, materials and plant costs	112 s.f.	.30	34
Forms for basement walls	460 s.f.	.35	161
Reinforcement Steel	6/10 ton	92.00	55
Structural Steel lintels	1000 lbs.	.06	60
Masonry—			
Brick walls	623 c.f.	1.40	872
Hung ceilings of metal lath and plaster (metal hangers)	225 s.y.	2.80	630
Plastering on exterior walls, partitions, wood columns and girders	277 s.y.	1.40	388
Metal lath on stud partitions	194 s.y.	.40	78
Carpentry Work—			
Wood furring and grounds in place for metal lath work			100
Stud partitions ready for metal lath	872 s.f.	.078	68
Hard pine framing (LLYP)	2-6/10 M	103.50	269
Short leaf spruce plank for subfloors and roof	4-7/10 M	53.00	249
Maple top floors (material delivered at site)	2 M	90.00	180
Lay maple top floor, including nails and paper	15-1/3 sqs.	6.00	92
Cast iron work for mill construction framing			100
Nails and spikes for plank			15
Painting walls and ceilings (2 coats)	223 s.y.	.35	78
5-ply tar and gravel roofing	5-1/10 sqs.	15.50	79
Net estimated cost of one bay only			$3,876

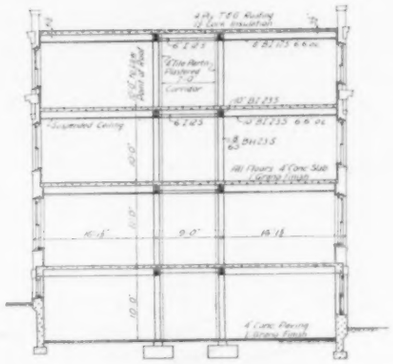
cious use of such information he should at no time be ignorant of the proper cost of the structure being developed. A budget estimate of cost should be made, which,—instead of being a guess predicated on a hasty calculation of probable cubic contents,— represents a reasonably careful computation of the cost of each major element in the proposed structure and a totaling of them all. An alteration in the character or form of any one of these elements will, obviously, alter the total cost. Hence, with his building problem thus broken up into logical and understandable elements, the architect is in a position to view his alternatives on the basis of good reason and to determine whether additional expense is in any way or at any time justified, or whether exactly the opposite viewpoint must be taken in safeguarding the client's interests. Uncertainty of cost should be as far as possible eliminated, thereby saving the architect the unhappy experience previously described, and this can be done by the construction cost expert.



SECTION C
"ALL REINFORCED CONCRETE"

Floor Area 2,145 square feet
Cube 22,255 cubic feet

	Quantity	Cost per Unit	Cost $
Concrete Work—			
Concrete interior and exterior footings (including materials, labor and plant expense)..	4-2/10 c.y.	14.00	59
Basement walls (including materials, labor and plant expense)	10 c.y.	14.50	145
Paving on the ground (1-2½-5 mix)	6 c.y.	12.25	74
Floor slabs and beams	54-2/10 c.y.	15.00	813
Granolithic finish	2022 s.f.	.10	202
Formwork—			
Interior and exterior footings..	112 s.f.	.30	34
Basement walls	460 s.f.	.35	161
Floor slabs and beams	2555 s.f.	.25	639
Exterior and interior columns (very small)	625 s.f.	.40	250
Reinforcement (steel)	6-8/10 tons	90.00	612
Steel Lintels (angles)	75 ft.	.70	52
Masonry—			
Brickwork (walls & face work)	369 c.f.	1.50	554
4" t.c. partitions at corridors	847 s.f.	.25	212
Plastering walls and ceilings (on masonry)	272 s.y.	1.40	381
Wood furring and grounds (in masonry)			160
Painting walls and ceilings (2 coats)	272 s.y.	.35	95
4-ply tar and gravel roofing (on concrete slab)	5-1/10 sqs.	14.00	71
1½" cork insulation on roof..			92
Net estimated cost of one bay			$4,606



SECTION D
"STEEL FRAME FIREPROOFED WITH CONCRETE SLABS"

Floor Area 2,145 square feet
Cube 22,255 cubic feet

	Quantity	Cost per Unit	Cost $
Concrete Work—			
Concrete interior and exterior footings	4-2/10 c.y.	14.00	59
Basement walls	10 c.y.	14.50	145
Paving on the ground	6 c.y.	12.25	74
Concrete slabs and fireproofing beams and columns	39-5/6 c.y.	15.00	598
Granolithic finish	2020 s.f.	.10	202
Formwork—			
Interior and exterior footings..	112 s.f.	.30	34
Basement walls	460 s.f.	.35	161
Slabs and beams	2802 s.f.	.22	616
Walls beams	91 s.f.	.30	27
Columns (small)	278 s.f.	.40	111
Reinforcement Steel including material and labor	4140 lbs.	.04½	186
Steel lintels (angles)	707 lbs.	.06	42
Masonry—			
Brick walls and facing	534 c.f.	1.50	801
4" terra cotta partitions at corridors	867 s.f.	.25	217
Plastering on masonry walls and columns	98 s.y.	1.40	137
Hung ceilings of metal lath and plaster with hangers	169 s.y.	3.50	592
Wood furring and grounds (in masonry)			160
Structural steel framing including labor and materials	6 tons	100.00	600
Allow for labor and materials to support outside ends of steel beams until brick piers are in place			50
Mesh for wrapping steel beams before concrete is placed around flanges	1678 s.f.	.04	67
Painting walls and ceilings (2 coats)	267 s.y.	.35	94
4-ply tar and gravel roofing on concrete slab	5-1/10 sqs.	14.00	71
1½" cork insulation on roof....			92
Net estimated cost of one bay only			$5,136

Answering the question as to why the architect cannot get his good friend Mason, the contractor, to give him estimates such as we have furnished here, I believe in the majority of cases where architects ask builders for estimates of this sort that the builder is more interested in making an impression upon the architect than he is in giving the architect his unbiased judgment. To most builders an opportunity to make such an estimate for an architect offers an opportunity to sell the architect the idea that he, the builder, must be tremendously economical in his work. To drive this idea home he is often likely to make very low approximate estimates which, of course, are misleading. Again, few builders have gone to the trouble and expense of compiling statistics on the efficiency of men on various operations. To make such a compilation requires, first, a large volume of construction work, and also a very efficient cost keeping system on the site in order that such data be available. We believe it is quite customary for concerns who have a large amount of estimating data to guard it very carefully. Free estimates are usually looked upon by architects as being nearly worthless and very likely to be confusing on account of their lack of frankness.

An actual example of the successful results obtained by coöperation between the cost expert and the architect is the best proof of the advisability and feasibility of adopting this arrangement. Therefore, we here describe the working out of an actual case that was most gratifying to all concerned. The construction of the building was carried out at a cost

well within the appropriation made by the client after a study of the preliminary sketches. Preferences, which could be classed as generalities, were expressed by the client, who also furnished the architect a minute description of the utilitarian characteristics expected of the building. Beyond this, the architect was left a wide latitude in the working out of the preliminary sketches of the structure. Fireproof building by no means prevailed in the community where this structure was to be erected. Consequently, the question of second-class construction was brought up. The value of a fireproof building was unquestionably recognized, but at the same time, the client, operating well within his rights, wished to know how much more he would be paying for this more modern type of construction. It was possible indeed that this added cost might have considerable bearing on the enterprise from an investment standpoint. In order that the architect might answer this question correctly, it was necessary to prepare brief comparative estimates, which in turn demanded comparative sketches of the typical cross-sections of the several types of construction available.

Accordingly, outline drawings of these cross-sections were made to which the dimensions and sizes of the major elements were added. Facsimiles of these cross-sections are reproduced here. Comparative estimates of cost based on each of these cross-sections were made, and in doing so items of work common to all schemes were purposely omitted. The tabulated result indicated the comparative costs of one bay of the building, 13 feet in length, consideration being given only to elements which underwent change in the various schemes. From these comparative estimates there was determined the total cost for each type of construction, and the architect and the client were able to select intelligently the scheme which should be incorporated in the plans.

The sketches which show cross-sections A, B, C and D were estimated in detail, considering only those items which were changed on account of the change in type of design. For instance, as these estimates were prepared for the purpose of making comparisons, it was not necessary to consider window sash, as the window sash would be the same in all four schemes. The roof, however, was considered, inasmuch as on a concrete roof only four plies of felt were required, whereas on a wood roof, five plies would be required to make an equally satisfactory roof covering. Painting was considered in all four schemes, as the areas to be painted increased where girders dropped below the ceiling line. It will be understood from this description that in preparing these comparative estimates, as they are called, it was not necessary to go into the items which we consider as common to all schemes.

The architect next produced sketch plans, showing a side elevation, and floor plans indicating partition layouts, and other preliminaries necessary to the compilation of a complete preliminary estimate in which all items of work should be assigned a proper probable cost, and which at the same time would furnish the client with sufficient and satisfactory assurance regarding the appearance and utility of the building. The estimate made from these last sketches (in which the reinforced concrete frame shown by cross-section "C" was used) has been produced here in detail, and clearly indicates what might be expected as a proper cost of the building carried out on the basis of the preliminary sketches and specifications. With an estimate at hand made in this manner, during the early stages of the work, appropriations may be more intelligently reviewed with a feeling of security to both architect and client.

Description of Office Building

The building on which this estimate is based is an office structure of modified Georgian architecture, of brick, three stories high, with a basement in which an assembly hall is located. The foundation walls of the building are of concrete carried up to the level of the first floor. The brick are of a deep red color, laid up in a manner to present the appearance of an early American bond in which alternate courses of headers and stretchers are used, laid more or less irregularly. Double-hung wood sash about 4 feet wide of Colonial design are used in all the window openings, there being two windows to a bay. The entire structural frame of the building is of reinforced concrete, with no beams spanning across the building except those in the end walls. Reinforced concrete slabs span across the building extending from the side walls to the longitudinal beams which run lengthwise of the building and are located over the main corridor walls. The ceilings in the offices are, therefore, entirely free from beam construction, making it possible to re-locate partitions at any time without considering ceiling beams or suspended plastered ceilings. The inside of the brick walls, except in the basement, were first waterproofed with an asphalt compound, then furred with 2-inch terra cotta split furring. The plaster was applied directly to the terra cotta furring and to the concrete ceilings, the latter requiring the usual bonding coat. The jambs around all window openings were plastered, wood trim being omitted entirely in connection with these openings. The doors, generally, were wood of Colonial design, set in pressed steel door frames and trim. Wood baseboards and picture mouldings were installed in most of the rooms.

The floors were surfaced with a granolithic finish, except in the assembly hall, where a maple top floor was laid on screeds and cinder fill, all of which was placed on a concrete base. Linoleum floor coverings are used in all the private offices in the first story. Slate thresholds were placed at the corridor doors leading into the offices. The corridors are lighted through transoms. Inside stairways are of steel construction with blue stone treads, fitted with wrought iron rails and wood handrails. The roofing is of tar and gravel, together with 1½ inches

Preliminary Estimate of Cost of Fireproof Office Building

Floor areas: 28,676 square feet
Cubic contents: 328,990 feet

Earth Work—			
Clear site of old buildings (now being done by owner).			
Steam shovel work, including teaming away to dump, about half-mile haul one way. Soil of hard gravelly material with some stones	2600 c.y.	$1.00	$2,600
Wood sheeting at ends of excavated area; (drive and pull including lumber)	1120 s.f.		500
Cut trees on the lot, backfill and grade at completion	(allow)		800
Hand excavation and backfill for footing holes	254 c.y.	2.25	572
Hand excavation in connection with operation of steam shovel	(allow)		300
Hand excavation for entrance steps and entrance platform (shallow)	73 c.y.	1.50	110
Reinforced Concrete Work: (all 1:2:4 mix unless otherwise noted)			
Concrete of mass type at entrance	32½ c.y.	13.00	423
Concrete for exterior and interior footings (including rental costs of all plant and fuel costs)	111 c.y.	14.00	1,554
Concrete work in small elevator pit (complete)			250
Concrete for foundation walls and pilasters on these walls	148½ c.y.	14.50	2,153
Concrete floor laid on the ground; (1:2½:5 mix)	104 c.y.	12.25	1,274
Concrete for exterior and interior columns; (very small columns)	80½ c.y.	15.00	1,208
Concrete slabs, including all beams and girders	598 c.y.	15.00	8,970
Granolithic finish on all floors except assembly hall	24510 s.f.	.10	2,451
Cement sanitary base for toilet rooms, colored black	296 l.f.	.45	133
Extra allowance for heavy concrete work in boiler room, foundations for boilers, etc.	(allow)		1,000
Concrete platform at entrance (complete)	216 s.f.	.75	162
Concrete buttresses for steps; (about 4 c.y. concrete each)	No. 2	100.00	200
Concrete steps at entrance; (linear feet of nosings)	154 l.f.	2.00	308
Concrete steps in side building in basement; (nosings)	99 l.f.	2.00	198
Concrete emergency exit at rear including walls and foundations	(allow)		400
Formwork, (contact surface measured) including material and labor			
Foundations under entrance	1752 s.f.	.25	438
Footings; (mostly piers of small dimensions)	2262 s.f.	.30	679
Foundation walls and pilasters	6888 s.f.	.35	2,411
Exterior and interior columns; (very small in section)	8228 s.f.	.40	3,291
Slabs, beams and girders	34595 s.f.	.25	8,649
Reinforcement; for all concrete work (including material and labor).			
Assume quantity at an average of 1½ per cent of all concrete (excluding concrete on ground and mass concrete)	93 tons	90.00	8,370
Carborundum Rubbing of exterior face of foundation walls			....
(Allow for especially good work)	1910 s.f.	.20	382
Masonry—			
Brickwork (labor, material, plant, etc.)			
Special bond to give the appearance of old brickwork, using a good hard-burned selected sand-struck brick costing about $20. M. at the site; (labor and material)	11060 c.f.	1.50	16,590
Two-inch split tile wall furring	6650 s.f.	.18	1,197
Extra for arches and lintel work over opening	905 l.f.	1.50	1,358
Boiler flue lining			100
Cast stone trim (plain belt courses and caps); labor and material and hoisting gear)	3135 c.f.	4.50	14,108
Eight-inch terra cotta walls (plastered one side) around flue and freight elevator well	440 s.f.	.80	352
Four-inch terra cotta block partitions (plastered both sides); (measured over all openings)	18540 s.f.	.55	10,197
Doors—			
Extra cost of doors and door frames, complete in place with thresholds:			
3 feet x 7 feet	No. 86	25.00	2,150
6 feet x 8 feet	No. 3	90.00	270
Small elevator doors (freight); (special type)	No. 5	$200.00	$1,000
Exterior doorway at end (complete)			250
Entrance doorway (complete)			600
Other exits (complete)	No. 3	150.00	450
Sash and Glass—			
Exterior wood sash and glass. Double-hung sash including trim erected complete and including attaching hardware	3289 s.f.	1.20	3,947
Weather strips			800
Plastering on brick walls and concrete work, ceilings and on furring (including preparation cost)	5100 s.y.	1.40	7,140
Extra cost of ornamental work in assembly hall	(allow)		500
Painting; 2 coats on all plastered surfaces	8740 s.y.	.35	3,059
Painting; on basement concrete ceiling when required			250
Painting on sash and doors	900 s.y.	.60	540
Plaster grounds for entire building			2,000
General millwork and hand dumbwaiters for entire building	(allow)		3,000
Ceramic floors in toilets	1246 s.f.	1.00	1,246
Marble w. c. enclosures and doors (complete with back)	No. 19	100.00	1,900
One-quarter-inch linoleum floors in private offices	150 s.y.	2.75	412
Maple top floor of screeds, sub-floor paper and top floor in assembly hall	2080 s.f.	.60	1,248
Baseboards of wood, chair rails and picture mouldings in all offices			3,000
Iron stairs, blue stone treads, w. i. rails and wood handrails	No. 4 flights	750.00	3 000
General miscellaneous iron and ornamental iron for entire work	(allow)		1,500
Hand ash hoist to street from boiler room			275
Tar and gravel roofing; (4-ply on concrete)	69 sqs.	14.00	966
Copper cap and base flashing	422 l.f.	1.10	464
Lead flashing for cornice and belt course			750
Conductor boxes	No. 6	15.00	90
One and one-half-inch cork on roof under roofing (laid complete)	6850 s.f.	.18	1,233
Hardware allowance			2,000
Clean up site at completion			650
Liability and public insurance; (fire insurance by owner); (about 1½ per cent)			2,100
Site superintendent, chief clerk, travel to and from site, supplies, site office, telephone, etc., etc.			8,000
Watchman			650
Allowance for cold weather protection during winter, as work was started in fall and would run right through the winter in a northern climate			10,000
Total for Building Proper			$159,128

Permanent Equipment

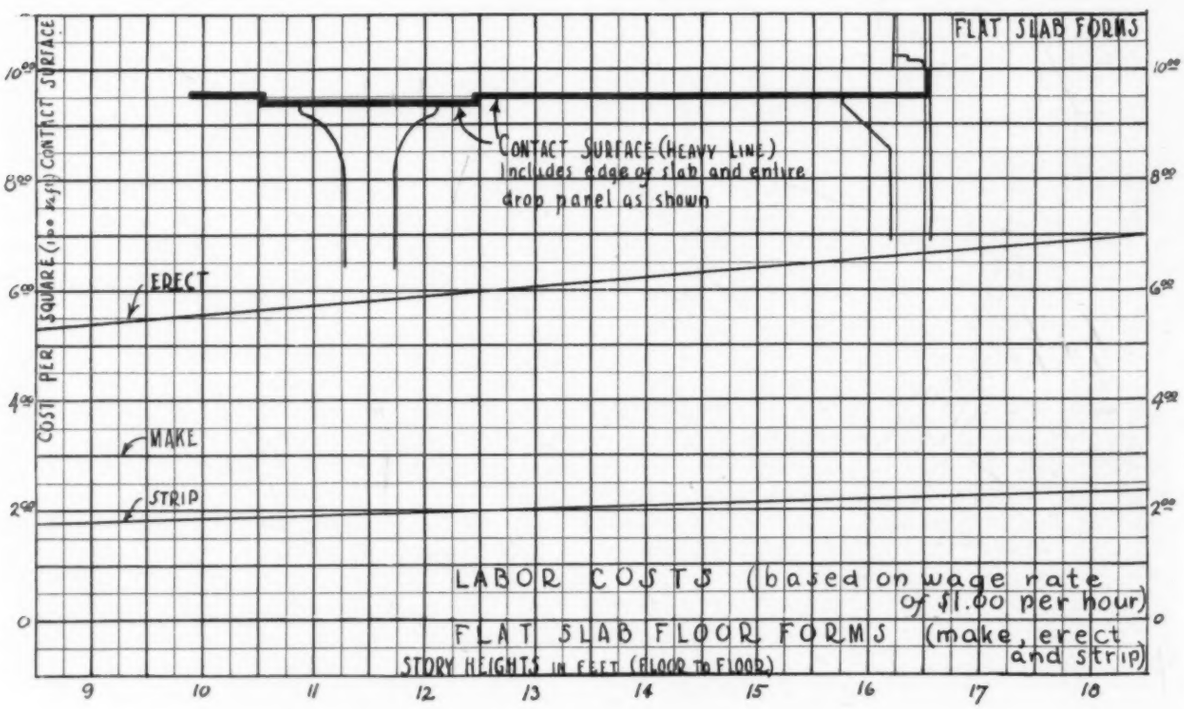
Steam heating and vent ducts:			
6150 s.f. rad. at $2 (small radiators)	12.300		
Boilers and stack complete	3,500	15,800	
Plumbing:			
Six conductors at $100 each	600		
Underground drains and sewers (allow)	1,000		
Water closets and urinals; 25 at $200	5,000		
Lavatories, 20 at $75	1,500	8,100	
Gas line to building		350	
Small capacity elevator for freight only,—of low speed		2,500	
Electric wiring (fixtures furnished by owner)			
570 outlets at $8 each	4.550		
Electric wiring	450	5,000	
Total for Equipment			31,750
Net Estimated Cost of the Building and Equipment			190,878
Builder's Fee (fixed at about 8 per cent)			15,000
			205,878
Architect's Fee (at 6 per cent)			12,352
Total Estimated Cost of Building			$218,230

Note—This is equal to about 65½ cents per cubic foot.

of cork insulation, which was placed on top of the concrete roof slab. All flashings are of copper and lead. The entire interior is painted, and the concrete floors are finished with a wax treatment. The building is heated with a low-pressure steam system using cast iron radiators, the system being supplied by boilers located in the basement of the building. All electric wires for light and other electrical apparatus are encased in steel conduit placed in the concrete slabs. The toilet rooms are spacious and fitted with a good grade of plumbing fixtures. One small slow-speed freight elevator was installed, the use of which is confined principally to the janitor and for the purpose of moving furniture from floor to floor. No sprinkler system was installed in the building. Construction work on this structure was begun about the middle of September and was finished the latter part of May. Work progressed continuously throughout the winter months.

Unfortunately, the unit cost data for a building of this type calls for considerable experience on the part of the estimator. There are a few items, such as timber and plank work, where data can be used without very much change. The brickwork of this building was of special bond, and the experience of the estimator was drawn upon to price this correctly. The items used in connection with the estimate of the scheme adopted were worked out from data which had been compiled for a number of years. In order to give an idea of how the data were compiled, the accompanying chart indicates the labor cost in connection with the erection of formwork for flat slab concrete floors. There are three lines drawn horizontally across this chart. The lower line represents the cost of stripping, the next line above the cost of making in the yard, and the top line the cost of erecting the forms in the field. At the bottom are indicated the story heights, and at the left-hand margin the cost per hundred feet, based on a labor wage of $1 per hour.

Charts of this kind are prepared for many different items of work. The placing of the lines on the chart is done only after exhaustive study of the efficiency of men on like operations, all of which is reduced to the basis of $1 per hour. Should the labor cost be $1.50 per hour, 50 per cent should be added to the indicated cost chosen from this chart. One will, of course, understand that the costs shown on this chart will vary with the amount of labor required in the formwork, even though the material is not considered in these costs. If a very heavy live load is required, which would call for 12 inches of concrete in the slab, the erection of the formwork would necessarily cost more on account of the additional lumber to be handled and additional posts to be placed. There have been tabulated in connection with this chart the percentages to be added or deducted, as the case may be, for form costs where the requirements vary from four posts per hundred square feet of contact surface. The chart is included simply to illustrate what pains have been taken by the cost estimator in order to compile a vast amount of data, all of which has been tabulated and is drawn upon in the making of estimates. There are many items, of course, where no data are available; it is in such cases that the estimator's experience becomes doubly valuable. As a rule the architect lacks the requisite intimate knowledge of costs which are supplied by the cost expert, but through collaboration he may obtain accurate estimates of construction costs.



PUBLICITY AND ITS VALUE TO THE ARCHITECT

BY

C. STANLEY TAYLOR

IT is perhaps unnecessary to develop any lengthy series of arguments as to the value of publicity from the architect's point of view. At least a large proportion of practicing architects recognize the direct benefits which accrue from the publication of their work in proper media, but it is surprising how few take advantage of the opportunities which are offered. Publicity is probably the most powerful factor in the development of background, which in turn tends to improve the quality and increase the size of the architect's practice. It is quite obvious that good work is slow to build up a practice unless it is made known to many people, and particularly to the types who might be prospective clients.

There are three major channels through which the architect can make known the good work which he has done, without lowering his professional standing and standards. These are, first, through the architectural press,—the publications of his own profession; second, through business papers and class publications, which penetrate into all divisions of the field of building construction; and, third, through newspapers, particularly local publications. The value of publication of an architect's work in an architectural journal is almost incalculable from the point of view of building professional standing. It seems strange indeed that this fact is not more clearly recognized, and that so few architects,—relatively speaking,—submit photographs, plans and descriptions to publications in their own field. We have heard a number of arguments on this subject, many of which were extremely shortsighted. Perhaps the most common negative is based on the fact that an architect does not see the value of placing his work before his professional brethren.

Here is the exact value of having work presented in the architectural publications. In the first place, such publication constitutes a definite recognition of the quality of the work, and represents a type of editorial approval which should be of considerable influence in discussing future projects with prospective clients. In the second place, it is of great benefit to the architect to be known throughout the profession. There are many times when prospective clients make inquiries through other architects as to the standing of those with whom they may expect to do business. It may almost be said that the original development of prestige in this field begins with comments of other architects, and it spreads gradually through interrelated contacts until suddenly there is a strong local following established and perhaps a national following. A third reason, which applies particularly to architects who are interested in having work published in the magazines of the home-building field or the publications of various commercial types, is that the editors of these publications study the architectural journals with great care, using them as sources of information for obtaining the names of architects whose work is thus recognized and in turn is of editorial interest in their own fields. There is another point involved, known to the publishing field as "indirect circulation." It is quite possible that an issue of an architectural journal which circulates to 7,000 architects is seen by two or three times as many persons, who for one reason or another are interested in architectural work. It is often the case that the prospective builder of a house or other type of building will study these publications for a time in order to gain familiarity with the work of active architects.

The second major channel of publicity, to which we have already referred, is that of the so-called business papers and class publications which circulate to various groups of people who are interested in the question of constructing new buildings. In the home-building field, there are eight or ten powerful magazines established, perhaps for different classes of people, but having primarily to do with the problems of home-building, furnishing and decoration. Most architects are interested in having their work published in magazines of this nature, but many fail to realize the great value of such publicity and do not coöperate intelligently with editors to secure this valuable form of recognition. Almost every type of building forms the background for editorial publicity to those who are interested in the building and operation of the particular type in question. For instance, there are important journals devoted exclusively to the hotel field, hospital field, school field, industrial field, public buildings, and others. These publications almost invariably take a definite editorial interest in the building problems of the particular industry they serve. They are constantly seeking good new projects for publication, and here the architect is offered an unusual opportunity. It may be said that good architectural work, regardless of the type of building, almost invariably can find its way into the printed pages which go before an interested audience. But obviously the architect himself must help this situation along. Editors do not always know where these buildings are, and the fact that an editor has not written to obtain work for publication is certainly no indication that he is not interested. Editors are constantly seeking good material of this nature, although they cannot take everything that may be submitted; this is logical, because they are restricted in their choice to subjects which interest their particular group of readers, and restricted by definite limitations of space, and often by general policies governing the type of material which is used editorially. Architects desiring this form of publicity should carefully study the publications which reach the type of people from among whom they draw their

clients or would like to draw them. If, for instance, an architect has completed a good hotel building, regardless of how small it may be, he should study the publications of the hotel field and send his material to that which seems to him most logical and most interesting. The best procedure is to write first to the editor enclosing a good photograph of the building with a general description of the work and asking him if he is interested in other photographs, plans and data.

Good photographs are the real backbone of modern publicity. This applies particularly to architectural work. It may be said that almost without exception good photographs will insure publication, because these are being sought constantly by editors, and there are not too many of them available. While it is true that the policies of most modern publications involve the obtaining of photographs with the help of good photographers, it is also obvious that if the material is supplied to them, they are more likely to use it than if it becomes necessary for them to examine the building before deciding to obtain photographs. The architect should employ the most expert photographer available, not only to properly record his work in order to be able to show it to prospective clients, but also to place himself in the position of supplying photographs for publication purposes. In this matter of obtaining publicity, ethics are involved, and editors soon learn to recognize architects who observe them. Usually any unethical procedure on the part of an architect in his relationship with editors is due to ignorance, and for this reason it may be well to mention certain common infractions of which architects are sometimes guilty.

In the first place, competing publications in any field discourage the sending of photographs to several magazines concurrently, because they are earnestly striving to prevent duplication. Editors prefer what are termed "exclusive releases," and if the architect will say to the editor that he is submitting his material exclusively to the particular publication in question, this immediately becomes a great inducement to publish it. This situation does not mean that buildings cannot or should not be published in an architectural publication and concurrently in magazines devoted to home-building interests or in trade journals. The publication in different fields and before audiences of entirely different character is generally acceptable to all editors. Thus, if an architect has designed an attractive residence, church, or other type of building which is being published in the architectural press, there is no particular reason why it should not appear in a home-building publication, church publication, or wherever its type may direct. There is also no reason why it should not appear in newspapers. Only a few magazines demand exclusive rights covering all the many types of publications.

Editors of practically all publications which have an editorial interest in the building field have learned to give the architect full credit in connection with the publication of his photographs and plans. Newspapers are not as universally satisfactory in this respect, and the architect should protect himself by definitely releasing the photographs or giving permission for publication only with the provision that credit is to be given to him for designing the building. This question of publicity in newspapers is one which is becoming important. Newspapers very often have home-building and real estate pages on which they are glad to present recent structures, particularly if descriptive editorial material is provided. This is, of course, the most direct manner in which to bring an architect's work before the public, and in turn to build up his prestige. Here the best procedure is to submit the material directly to the editor without writing beforehand. The newspaper editor is very busy and will often not indicate any interest until he sees the material and recognizes its value.

For those who are interested in this subject of publicity, it may be noted in more detail that aside from architectural journals and newspapers, there are important publications in several fields, which take a definite editorial interest in current architectural work. These fields include hotels, theaters, hospitals, schools, clubs, apartment buildings, office buildings, banks, industrial plants, real estate, building management, dwellings of all types,—in fact any type of building which an architect designs can find its special type of publication. One prominent architect now enjoying international reputation has for years made it a definite practice to provide editors with photographs of his work upon request, often submitting the material as soon as it was ready. This same architect has written many articles for newspapers and magazines, and according to his own statement he has largely built up his national and international practice and prestige through the results of this widespread public knowledge of his work. He tells the interesting story of one article illustrating a particularly attractive house which brought 129 letters definitely referring to the house illustrated, and resulting ultimately in a number of important commissions.

There are, in fact, a fairly large number of architects, most of whom are known throughout the profession, who have built up their practices partially through the force of publicity. After all is said, it is still evident that the architectural light which remains hidden under a bushel is not likely to be seen, and it is also true that even the architect's friends forget him if his activity is not occasionally brought to their attention.

PERSONALITY AND PROSPECTIVE CLIENTS

BY

WILLIAM A. EDWARDS

EDWARDS & SAYWARD, ARCHITECTS

IN this era, the greatest of all ages for building, the practice of the profession of architecture has become the work of an organization of well trained and scholarly men, going out after business, rather than of the dignified and reserved individuals of the past sitting waiting for clients. The success of the practitioner of today is measured by his capacity for getting business and his capacity for executing it well. The first shows his capacity as a salesman; the second his capacity at keeping it "sold." Both are of the greatest importance. Think of the woeful plight of the most wonderful potential organization at carrying out a commission without a commission to carry out! Too much cannot be said, therefore, of the importance of expert salesmanship legitimately exercised in the profession. This salesmanship is not trivial, like selling a peck of potatoes, a yard of cloth or other such tangible things. It is the adroit placement of personality that persuades the prospective client to actually retain the architect to take over and expend his money in transforming his dream into the reality of a building. This is a very delicate matter, as it is equally a responsibility. To assume it, the architect must be amply prepared to carry out the obligation. It is very fine, too, for the architect to have good equipment and organization back of him to give zest and confidence to his advocacy.

The fundamental basis of successful salesmanship is psychology, with the use of diplomacy in its exercise. No two human minds that may be pitted against each other are alike, and each personality must be analyzed from points of environment. Kinships, school life, college and club life and other relationships among men must be studied and understood. After so informing himself, the architect may approach his committee or individual with confidence, at least of leaving a good impression even if a sale cannot be made. It must not be forgotten that the greatest of sales are often made even when the objective commission is lost. Winning the way to a man's mind and to his consent is for the salesman to agree with him and speak pleasingly of his vanities. There is plenty of time to persuade him to different views and convictions after he has been won. The successful salesman must think very little of the commission he is after, but mostly of the man or set of men who have the commission to give out. What he or they want must be the salesman's chief consideration. On one occasion a board advertised in current papers and technical magazines that it was charged with the duty of erecting a new university, and would meet on a certain day for the purpose of hearing architects on the subjects of how best to proceed to the employment of an architect and how best to proceed with the building of a university on 500 acres of ground. Seventeen architects met this appointment, and each in turn was given a private interview. From back room comments, the vast majority presented themselves before the board with only one thing in mind, viz: getting the work. Others, more familiar with the situation, were of the firm conviction that the board had already been instructed politically as to the architect to whom the award must be made, and that it was therefore useless to treat the meeting as more than simply a gesture.

The architect ultimately chosen, however, complied directly with the request that was advertised, and seized the opportunity to represent the profession with dignity, and to present truthfully his belief as to the best method of selecting an architect and to set forth with his best knowledge the proper way to proceed with building their university. He took occasion, as he advocated the employment of an architect on account of his personality, office equipment and experience, to advocate their employment of an architect on that very day, if there were one that met their approval. He only said in his personal behalf that if they were not prepared on that day to make such employment, he would be entirely satisfied with his efforts if they would make a full investigation of his firm, looking to employment. The result of this meeting was that 15 architects were promptly eliminated, leaving only the political favorite and this one other architect to make presentations of preliminary studies illustrating an administration building, a dormitory and a general prospectus plan, as a criterion for aiding them in making a selection of one of the two as architect. The final result was that the political favorite failed of success, the other was employed, and his firm remained over 30 years the architect of this board for all work it did, receiving many other similar awards of work elsewhere, due to this success, besides much attendant private work, making a healthy nucleus for a permanently successful practice.

One of the hard problems the competitor for business has is the tendency eternally of a prospective client to consider the financial basis in connection with the employment of his architectural talent. Howsoever erroneous this may be, it is a problem that the architect in approaching his prospect has to contend with, and for success he must have his mind made up and be willing to lose rather than reduce his fee. One thing may truthfully be said in favor of holding to the regular professional fee, and that is that no client wishes his architect to cheapen himself. In public service, however, a board is wary about paying to its favorite architect a higher fee than any other good architect offers his services for, fearing the reprimand of the public.

It was the experience of an architect upon one occasion to meet a school board by appointment, at

which meeting there were ten other architects, each to present himself in turn, giving credentials, presenting illustrations of work that he had done, and giving every good reason that each had in self-advocacy, justifying his employment. The difficulty encountered in final conversations between the preferred architect and the board was that the vast majority of those presenting themselves had offered to do the work for 1 per cent less; otherwise, the board desired to have the services of this architect. The prompt response was that the price of services was not a proper criterion to be used in selecting an architect, so long as a standard fee was not exceeded, for in the end a cheap man would likely cost the most. Also, if the price to be paid were a consideration, their preferred architect should receive a higher fee in equal proportion to such preference. In other words, they were asked how many dollars they preferred to the man of their choice. The difficulty still remained after all argument, and finally a written contract of employment was prepared and presented. This contract was accepted and contained a clause permitting the board to hold back 1 per cent of fees until final completion of the work, and if, at that time, the members were satisfied entirely with the type of services rendered and were satisfied that the architect had duly and properly earned the fee claimed, they were on their own election and volition to pay over the 1 per cent to the architect. If not so satisfied, they were to retain the 1 per cent, and that they themselves were to be the judges. The result of this transaction was a happy ending, with all persons more than pleased, and the architect without comment received his full fee.

Many failures of an architect in the matter of salesmanship come in meeting a prospect in the form of an individual who is a supreme dictator of his community and board, and who abruptly and rudely dismisses him and turns him away because the architect himself has failed to get hold of the idiosyncrasies of the man he approaches. On one occasion, an architect went to the town where a school building was to be erected. It was promptly learned that this was a "one-man" proposition, and if one could gain audience and win him, the work would easily be awarded according to his choice. Many architects had been individually to see this man, and all spoke of him as "an old crab" and impossible to interview. Our architect, undaunted by these advices, proceeded to the town to try out his cunning. Arriving at an early hour, he immediately proceeded to become acquainted with the people of the town and soon found the friends of this man, who spoke in the greatest of confidence and praise of him and his useful citizenship, his cordial ways of dealing with people, etc. Our architect was told that others of the town, however, considered him a very stern character, hard to approach and get close to. So our architect proceeded immediately to consult with them. Out of the conversations with both factions, all of the weaknesses and vanities of the objective man were discovered and digested. It was found that he took great pride in the little town, and that he, at his own personal expense and time, had created a beautiful avenue with beautiful shade trees, and that this avenue was his pet hobby. Thus armed, our architect, after the morning mail was disposed of, proceeded to test his mettle before this exacting small town ruler. Here is where the private secretary came in, for he (or she) who is the buffer must also be successfully sold in order to gain audience. This process being gone through with, the architect was admitted, and the man reposefully greeted him.

After making a few preliminary remarks in the hope that his coming in was not an encroachment on his valuable time, the architect was asked to be seated. Upon being thus seated, he immediately spoke of his coming to town early in the morning and what a privilege it was while waiting, to walk over the principal streets of the town and to find it a beautiful and well kept little place, and particularly was it his delight to visit the beautiful sycamore drive in the suburbs of the town. The tender spot was found, and the great man grew chesty, pulled out his cigars, leaned back in his chair and told the architect the history of the little town and his doings about it,—which was listened to with interest. After spending more than an hour without indicating his business, our architect arose with apologies for over-staying his time, and while standing mentioned the object of his visit. Very few additional remarks were necessary, for our architect was told that his firm was well known and particularly in connection with school work. He said, however, that the matter would necessarily have to be taken up in board meeting. A few days elapsed, and in came notice that the board had made selection of our architect's firm to do the work.

A situation in one of our states had developed very much to the embarrassment of the architectural profession by reason of the unsuccessful dealings of an architect in the execution of a piece of state work, in which instance even charges of corruption were intimated. In an atmosphere of this kind, an architect approached a board of trustees whose chairman was a United States senator, a successful politician and very much a browbeater to those who approached him for consideration. He, however, loved the combat of minds and despised persons approaching him who did not give him back in kind equally as he dealt. The method of handling him, therefore, was necessarily with gloves off. Convincing retort handed back with courage but kindliness is what it took to win him. He and the architect talked on the campus alone together after a number of sessions before the committee, and the senator proceeded at once to explain the disrepute in which the profession happened to be held at that moment. The quick retort was to remind him of the many United States senators who had brought reproach upon our country, and that United States senators after all, are human beings, subject to all the infirmities of other human kind.

and that it was greatly to the benefit of the United States senate and the profession of architecture, that a vast majority of both were men of noble character, and there was no reason why a good United States senator and a good architect could not yet relate themselves with each other in perfect confidence.

It was soon discovered that the distinct object on the part of the senator was to tell the architect of his excessive fees. The senator said that for one building he was asking more compensation than had been paid for similar services for other buildings on the campus. Readily the retort was that the buildings on the campus were a just demonstration of the wisdom of his statement, and, that had a decent architect been employed in the first place, there would not be felt the same necessity for a consuming fire, as existed; and that it was high time to turn over a new leaf in the affairs of the institution. Furthermore, he was reminded that he had just discussed the profession of architecture in a derogatory way, speaking of its low ebb, and that the proposition that the architect should render his services for less, coming from a state official in such a high position as he, was itself a corrupting proposition. The profession, he was told, must have sufficient compensation to do services properly, and that an established fee legally recognized before any court as equitable should be adopted and accorded to the architect, and that it would be very much against the state's interest if he employed any architect who would cheapen himself by taking a piece of state work for less than such a fee,—that the result would be lax service, which was as bad in consequence as bad manners.

After many arguments the senator went away fully convinced, made report to his board, and the award was made to the architect with full fee. More than that, the entire board of trustees then in session felt that the services of the architect during the several days of the session deserved their consideration, and a handsome check was sent him in addition to the award of the full fee. When the services were ended and the final check for services was given, the senator stood up like a man before the architect and said: "In handing you this final payment, I wish to add that your services have been of a high order, greatly to the gratification of our board, and I personally wish to say to you that the state has not paid a cent too much for your services."

In the era of plan-juggling of 20 years ago when highly colored drawings of court houses and schools greatly factored and flourished, the impostor in the profession of architecture had his greatest day. This practice is sometimes encountered yet, and has to be dealt with by the practitioner. On one occasion, architects were invited to present sketches in competition to a school board. It happened that a wealthy and prominent citizen of his state and community lived in this district, and the board in charge desired his approval of its operations, since this man paid a major proportion of the taxes of the district. The sketches, therefore, were required to be sent to his home town on a certain date and then to be carried to the county seat for final discussion before the assembled school board.

Incidentally, the architect of this tale followed his sketches and acquainted himself with the chairman, who was the strong man of the board, before the meeting for the submission of drawings. A number of architects met on this day of final submission, many of whom violated the instructions to send drawings in as already explained for preliminary consideration. In its deliberations the board, however, made no discrimination against those who did not comply strictly with the advertisement. The impostor architect was there and showed the board drawings for a building two or three times larger than those of any other competitor, guaranteeing its cost to be within the stipulated price. The chairman of the board, happening to be a builder, knew that this building could not be built within the amount of appropriated funds, but believed the others could. Consequently, the first days' deliberations of the board reached no conclusion and were held over for further consideration the next day. In the evening, the chairman of the board was called to the hotel room of the impostor-architect, and adroit overtures of all kinds were made to him to accept a fee to supervise the construction of the building, receiving the compensation from him,—the impostor. This was listened to with interest and declined, and finally the impostor-architect made the proposition to pay him the entire fee accruing from the commission for the award of the work to him, claiming it to be an advertisement to design this building which would justify this business action.

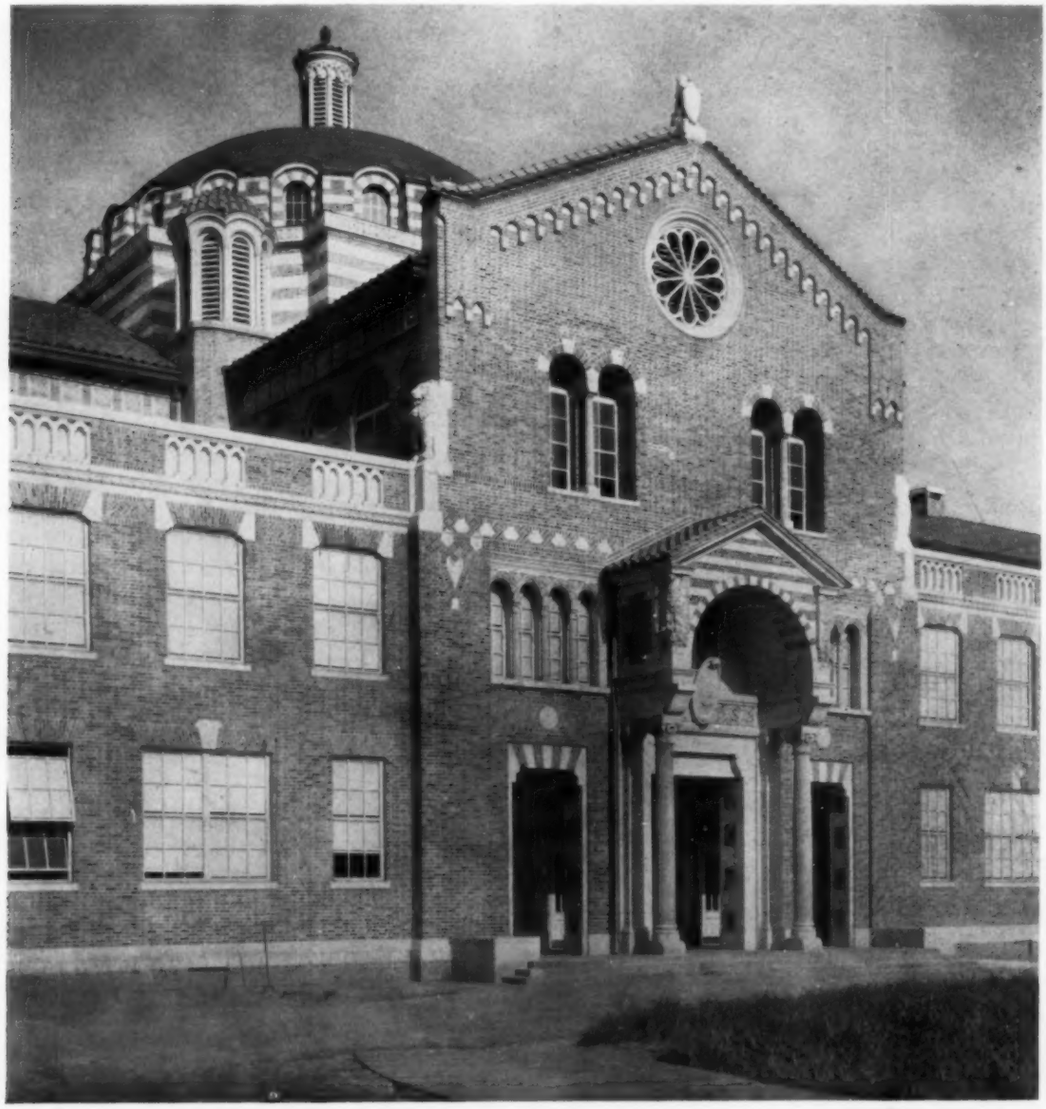
The chairman, wise and honorable, came to the architect who ultimately secured the work, setting forth all the facts, including that there must be a guarantee that the building would be built within the funds appropriated, with the contract awarded to a responsible contractor and with a surety bond for 100 per cent of the contract price given. The chairman's statement was that—"I know there is a nigger in the wood pile somewhere, but tell me where it is. I know he cannot do what he says he can do." In the first place, this chairman was told that he would have to make a check for services payable to the impostor-architect, which he would pocket and carry away, and that he would not be able to get it back if he wanted to. In the second place, the impostor-architect would award the contract within the contract price, deliver the bond, as agreed and proceed with the work. Over the impostor-architect's signature, his board would be compelled to make payment to the contractor. A certificate in excess of a just proportionate amount paid to the contractor would be a violation of the bond, and by collusion between the impostor-architect, the contractor and the bond salesman, they could secure the first payment with all apparent legitimacy, then walk out of town leaving them with the "bag to hold" without any legal recourse whatsoever. He was also told that many

things as infamous as that had happened. The result of the deliberations of this board was a complete turn down of the proposition and the award of the work to an architect in whose judgment and plain statements this chairman had implicit confidence, and whose design was preferred by the millionaire citizen.

The only times we know of the infamy of the impostor-architect is when he is unsuccessful, and only then the true story is related. Many such things happen in our professional business, but those involved either by ignorance or infamy will decline to tell the story for the same reason that the victim will not relate the story of the rape of the confidence man if he is "picked up." The beauty of the long run, however, eliminates and abates crime and ignorance, and wonderful is the waiting that in the end finds virtue and success eternal. Enlightenment, of course, eliminates the impostor, who is only a time server. The reader must bear in mind that successes are attended with many failures. Failure defines the meaning of success, and by that we know and appreciate it. No one loves to hear the stories of failure, which are seldom told.

Personality plays a most important part in all dealings with prospective clients and no less in one's contacts after the contract is signed. Each client differs in attitude, taste and prejudices from every other, and the architect who takes the particular characteristics of each client into account and governs his own conduct and conversation accordingly, is the most likely to be successful.

It is hoped that the potential architect may find food for his imagination in the actual incidents related here, and proceed with courage to his trust to make good and advance his profession in the dignified ministration it truly gives to the building world.



Entrance, Girls' High School, Atlanta
Edwards & Sayward, Architects

FEE PLUS COST SYSTEM FOR ARCHITECTS

BY
WILLIAM STANLEY PARKER
OF THE OFFICE OF R. CLIPSTON STURGIS

THERE is more than one way to skin a cat, and I suspect the same to be true regarding the use of the fee plus cost system in architectural practice. Its two elements, fee and cost, are both variable at will. The fee may be made to cover the entire services of the members of the firm, or it may be in addition to other charges based upon the time they actually spend on the work. The items of cost may or may not include the just mentioned items for time spent by members of the firm, and may well vary in minor items charged by some as cost, by others as overhead. In writing on this subject it should be understood that I am not describing the only method or even the best method of charging on this basis, but merely the way in which the office with which I am associated has been using the system for practically 25 years.

It will be well first to state just what our fee covers, what items are charged at cost, and what items are covered by overhead and how they are charged for.

The fee is the profit item for the office as a whole, in which Mr. Sturgis and his associates have variable percentage interests. Mr. Sturgis' interest in the fees constitutes his whole interest in the earnings of the office, no other charges being made for any time spent by him. Apart from the fee our charges fall under these various headings: "Drafting and Overhead," "Engineers," "Clerk of the Works," and "Miscellaneous."

Under *Drafting* is entered, at their various hourly rates, all time spent by members of the office other than Mr. Sturgis, whether that time is spent on drafting, specifications, conferences, or inspection. The total of these drafting charges is doubled to cover overhead. In our case *"Overhead"* includes rent, stenographers, office boy, telephone, postage, supplies, cleaning and time spent by members of the organization on office work, such as office conferences and general office problems not related to any particular project. We have found that with an average volume of work the total drafting charge is substantially the same as our overhead items. In busy times it is more, in slack times it is less, but these two equalize each other in the long run.

Under the heading of *"Engineers"* we include, at cost, the fees of structural and domestic engineers, and any other specialists that may be engaged on the work.

Under *"Clerk of the Works"* we charge at cost the salary of the clerk of the works if one is employed. Occasionally, when a clerk of the works ought to be but is not employed, we estimate the additional office supervision that will be required and charge it under this item instead of under drafting. This means charging the time spent in such supervision as single time, not doubled to cover overhead as for other drafting time. This is fair to the owner, as it charges that time singly, as the time of a clerk of the works is always charged. It is a burden to the office, however, as it reduces the drafting time with which to cover the overhead.

Under the heading *"Miscellaneous"* are charged up net for reimbursement the various minor expense items directly connected with the particular commission, such as traveling expense, long distance telephone and telegraph, blue prints, models and similar items.

Perhaps the best way to illustrate the system is by a copy of one of our "Monthly Statements." Our bills are properly so captioned, because all our accounts are based on monthly payments on all our cost items and also on our fees. In the case of the latter about 20 per cent is withheld for payment upon completion of the work, the balance being divided into monthly payments during the estimated duration of the project. Thus the statement herewith reproduced is the third statement issued, the fee item (entitled "Professional Services") being the third of nine monthly payments of $130 each, a total of $1170, the balance, $130 (in this case 10 per cent of the $1300 fee) being held for payment on completion. The first column, "This Statement," is the current account payable. The second column, "Previous Total," is the accumulated total of all previous statements. The third column is the estimated or guaranteed cost of each item.

At the right the current summary is repeated, but these spaces are primarily intended for use when a guaranteed limit of cost for certain items has been agreed to. When this is true the items guaranteed are generally limited to the fee, drafting and overhead, possibly also including engineers, but generally not including the other items. This final right hand summary can show the condition of the guaranteed amount,—already paid, current charges, balance remaining. In such a case the items in the third column that are not included in the guaranteed limit are marked with an asterisk.

In an effort to reduce to a minimum the time required for entering the drafting charges of the various projects, we developed a monthly time sheet for each man as here reproduced. This is 9 x 12 inches and vertically is divided into five weeks of six days each, some months for accounting purposes being "five-week" months.

The three final columns are for the totaling of hours spent each day and each week, and the daily record and accumulated total of "due" and "ex"-cess hours, or in other words, the number of hours a man

is behind or ahead of the normal number of hours covered by his weekly salary, showing whether he owes the office or the office owes him a balance.

The right hand totals adjust each man's time and money in relation to the office. The totals at the bottoms of the columns show the total hours spent on each project and the total charge against the project.

This monthly time sheet has saved a great deal of time previously spent in making entries on weekly time sheets from which the various subdivided entries were drawn off and entered in ledgers. This one sheet now gives each man's complete record for the month. The totals are of course entered in the ledgers against the appropriate projects and the office accounts.

All this indicates briefly how accounts are kept and charged.

The exact amounts indicated in this Statement are of no significance, nor would any reproduction of exact charges rendered on different kinds of work be illuminating. No two offices would arrive at the same amount, either estimated or actual. The Fee, Drafting and other items would all vary, for a given piece of work, due to different office practices. This typical statement form is reproduced merely to indicate the way in which the few items involved are recorded from month to month, each statement conveying to the client a complete account to date.

Our form of agreement with the client, after defining the work and the service to be rendered, recites the given items and how each is charged for. It also arranges for the adjustment of the contract in case it is terminated, and we feel it does this in a simpler way than that contained in the Institute Fee Plus Cost form. In our form the owner, if he terminates our employment, pays all charges provided for up to the date of such termination and the portion of the fee, usually about 20 per cent, that is due upon completion of the work. This is definite, without any items to be settled by agreement, no discussion is involved, and the withheld balance of the fee will be found to adjust the matter of fee with substantial fairness, no matter at what stage of the work the break may come.

It of course is but seldom brought into play, but when it is there is hardly a possibility of strained relationships under which amicable adjustment of any uncertain financial settlement might be difficult. Our method is simple and positive and obviates any discussion.

We have used this system of charging with many different types of clients. Frequently in talking about the system with architects they have said that it was logical enough, but it meant explaining the system to each client who wouldn't understand it and who would be familiar with the percentage fee, and so it was simpler to stick to the older method. This bugaboo of what the client will think is largely in the mind of the architect rather than in that of the client. The number of clients, in our practice, that have disliked the system or found it difficult to understand has been negligible.

Generally they feel it is sound and reasonable. Sometimes they want to translate the result into terms of percentage, but while they may do this in their own minds, there is seldom any particular comparison. They rather like the basic idea that our fee is a fixed amount, regardless of any fluctuation in the final cost of the work. If the work is increased or diminished to any substantial degree, after the agreement is settled the amount of the fee is adjusted accordingly. This is seldom necessary and never a source of difficulty. Apart from such cases the fee is a fixed amount.

All the other items, however, are stated as mere estimates and not guaranteed, and so they will vary according to the conditions as they actually develop. If sketches are promptly approved, if frequent changes are not made in the drawings at various stages of the work, if the construction is carried through quickly and competently by the contractor, most of which matters are beyond the definite control of the architect, then the drafting and overhead charges will be kept at a minimum. If reverse conditions develop, such charges will doubtless increase.

Some clients of course, for varied reasons, prefer some kind of agreed limit, but they have been rare in our practice. In one case it may be that they will want the total of the fee, drafting and overhead, and structural engineers, to be not in excess of some named percentage because these items comprise the services generally covered by a percentage fee. In another case they may prefer a guaranteed limit for all services, even including the clerk of the works. These varying desires should be met by the architect in an accommodating spirit, and a clear knowledge of past office experience on similar projects makes it relatively easy to determine fair amounts in any such case. Certainly it requires no greater degree of acumen and prescience than is required in many cases to determine what percentage will be appropriate and just what that percentage will cover.

Of course the simplest mental operation is with a hard and fast schedule, say 6 per cent, for all kinds of work. But it is neither very scientific nor fair. One architect said to me once that he had always done all his work on a 6 per cent basis, but always lost money on his houses and helped cover this loss with his commercial buildings. Now it seems to me unfair, both to himself and perhaps in many cases to his fellow architects, to take, for instance, houses at a percentage below actual cost. It is an economic absurdity to design and supervise an owner's dwelling for less than the service costs one. And it is quite likely that some other architect who perhaps doesn't have much commercial work and who charges for house work at a rate that will produce a profit, may be told, "But so and so does houses at 6 per cent.

THE OFFICE OF
R. CLIPSTON STURGIS, Architect, 120 Boylston Street, Boston

MONTHLY STATEMENT December 1, 1927.

John Doe Esq., *To Office of R. CLIPSTON STURGIS, Dr.*

For Work on House *at* Blank, Mass.

SERVICE	THIS STATEMENT	PREVIOUS TOTAL	ESTIMATED OR GUARANTEED COST	DATE OF AGREEMENT
Professional Services 3 of 9	$130.00	260.00	$1300.00	Oct. 1, 1927
Draughting and Overhead	554.14	1090.84	2000.00	
Engineers		29.44	50.00	
Clerk of Works ..... *at*				
Printing Specifications				
Incidentals	14.17	17.50	100.00	

Previous Charges $1397.78

This Charge $698.31

Total Charges $2096.09

APPROVED

Total $1397.78 $3450.00 *Balance*

Account Rend.

TOTAL DUE $698.31

Received Payment,

Note: Items starred are not chargeable against limit.

A Complete Statement is Sent to the Owner

Why do you charge more than he would charge?"

If an architect uses a percentage system, he certainly must adjust the percentage to suit different types of work, and in each case there will be additional items to be charged at cost. These items will always involve miscellaneous expenses such as travel, etc., and I suspect with most architects the cost of domestic engineers will also be charged for apart from this percentage, though doubtless many now include them in their fee.

The difference between the systems is therefore not so great as it sometimes seems. It is a case of a "profit fee" plus costs or a "percentage fee" plus costs. In either case an appropriate total can be arranged with no difference in the amount of judgment involved. The main difference is that the so-called "fee plus cost" system is based upon each project, carrying a stated professional fee that is guaranteed, in addition to reimbursement of all costs, and that this fee when once established ceases to be affected in any way by the cost of the work. It goes without saying that I am speaking primarily of operations of definite extent and not those that are indefinite in all their major factors of size, time and cost. But even to such enterprises the system is equally applicable.

This method of charging is so flexible as also to fit quite easily those operations involving repeated units, like housing developments, to which the standard percentage fees cannot be applied without adjustment. Obviously the character of the service, its duration and the approximate total cost of the work must all be considered in either case. In the fee plus cost method the resulting estimates of profit and cost can be set down direct. In the percentage method they are translated into terms of a percentage, and that is set down. Which is the simpler method?

The advantages of the fee plus cost system from the point of view of the architect are therefore, (1) a known fee or profit for the architect; (2) an assured sum each month from the owner, covering the actual cost of the office work and the proportional amount for overhead, which simplifies the financing of the architect's office; (3) more prompt and definite decisions on the owner's part and freedom from annoying changes in the work, since he realizes he must pay the additional costs of drafting involved each time he changes his mind about this or that. Under the percentage system the architect is often imposed upon in the matter of changes due to whims of the owner, and an unfair burden of cost is placed on the architect through no fault of his own. With the fee plus cost system the owner pays for all work.

MO. OCT. YEAR 1927 — OFFICE OF R. CLIPSTON STURGIS ARCHITECT — MONTHLY TIME SHEET OF JOHN DOE

DAY	THOMAS –		LANE		CHANDLER		FRENCH		MC'ARTHUR						PROSPECTIVE		OFFICE		S-H-&-V		TOTALS DAY	TIME WK	TIME DUE	TIME EX	TOTAL DUE	TOTAL EX
Sept 27																			ill	7	7					
28																			"	7	7					
29																			"	7	7					
30		4		3														1			8					
31		4		1														2			8					
1		3																			3	40				1
3		4		1											DR. P.	2		1			8					
4	at job.	6																2			8					
5		4						2										2			8					
6		3½		2		1½												1			8					
7		5		1														1			7					
8																						39				
10																							8			
11		4		3																	7					
12																			Hol.	7	7					
13		4		1		1												2			8					
14		5		2														1			8					
15																		1			1	31			8	
17		6																1			7					
18	at job	6																1			7					
19		6																1			7					
20		6																1			7					
21		5													Mrs S Garage.	2					7					
22																						35	4		4	
24									7												7					
25									7												7					
26									7												7					
27									7												7					
28									7												7					
29									4												4	39				
JOB H'RS.		75½		14		2½		2		39						4		18		21	184				11	
JOB CHGE	154	77	28	70	5	13	4	10	79	95					8	20	36	90	14 43	35 05	377.20				22	55

The Monthly Time Sheet of Each Draftsman Facilitates the Apportioning of Charges to Each Project